

## SECTIONAL MEETINGS

Details of technical meetings follow. See map for building locations. Business meetings are scheduled for each section. An important item of business is the election of officers.



## A. ZOOLOGY

MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 229

DAVID F. YOUNG, PRESIDING

- 9:00 THE PECULIAR SPERM OF THE FRESHWATER GASTROTRICH LEPIDODERMELLA SQUAMMATA: FINE STRUCTURE AND SPECULATIONS ON FUNCTION. Margaret R. Hummon, Department of Zoological and Biomedical Sciences, Ohio University, Athens, OH 45701.

Formation of sperm in L. squammata is confined to the post-parthenogenic (PP) phase of the life cycle, after deposition of 4 parthenogenic eggs. During the same PP period, synaptonemal complexes (SC) indicate that meiotic stages also occur in oocytes. Self-fertilization apparently does not occur; isolated individuals may deposit a small egg during the PP phase, but the egg either disintegrates or hatches into a small, short-lived juvenile. The formation of sperm proceeds mid-ventrally, through an orderly process similar to that in other animals. Four 1° spermatocytes with SC give rise to 16 spermatids and then 16 rod-like sperm. Development of spermatids involves the apposition of the plasma and nuclear membranes around the dense, elongate nucleus, and the isolation of excess cytoplasmic components into a single ephemeral androsphere. The mature sperm lack cytoplasmic organelles other than the plasma membrane. Sperm with this morphology have not been previously described, other rod-like sperm having at least a sparse manchette and a few mitochondria. By analogy with some insects, such sperm should be highly specialized for internal cross-fertilization involving specific accessory structures. However, L. squammata lacks male or female ducts and pores. A ventral posterior X-body is derived from female gonad cells and packed with granules actively produced in the PP period. The presence of SC confined to the PP period and implied chromosome homology, the PP development of the X-body, and the extended PP survival all argue for a function for the PP gametes in reproduction. Cross-fertilization is implied by the absence of self-fertilization, but a mode of sperm transfer is not apparent.

- 9:15 DESICCATION INDUCED GLYCEROL SYNTHESIS IN OVERWINTERING GALL FLY LARVAE. Richard E. Lee, Jr., Department of Zoology, Miami University, Hamilton, Ohio 45011 and John G. Baust, Department of Biology, University of Houston, Houston, Texas 77004.

Third instar larvae of the goldenrod gall fly, Eurosta solidaginis (Fitch), overwinter inside stem galls of goldenrod (Solidago spp.). Freeze tolerance is acquired as larvae sequentially accumulate glycerol and sorbitol for cryoprotection. Glycerol levels rise in early autumn while ambient temperatures are relatively high ( $>+10^{\circ}$ ). In contrast, sorbitol synthesis is triggered only when environmental temperatures drop below  $+5^{\circ}\text{C}$ . The role of desiccation in regulating glycerol accumulation is examined in this study. Galls were collected at 7-10 day intervals from October through February in Houston, Texas. Whole body supercooling points were initially high ( $-10^{\circ}\text{C}$ ) then decreased abruptly in late November ( $-18^{\circ}\text{C}$ ). The water content of the plant gall decreased from 70% to 30% by December. This reduction was closely paralleled by larval synthesis of glycerol. Although larval water content remained constant during this period, the weight of individual larvae decreased from 70 to 40 mg. Laboratory desiccation of larvae at  $22-24^{\circ}\text{C}$  also resulted in an elevation of glycerol levels. The data suggest that seasonal glycerol accumulation is initiated in response to plant senescence.

- 9:30 LONG-TERM, CLIMATE-MEDIATED, SOLAR EFFECTS ON BRITISH IMMIGRANT LEPIDOPTERA, 1855-1955 John F. Wing, Eric Johnston, and Steve McFarland, Departments of Biology and Psychology, Wittenberg University, Springfield, Ohio 45501.

The logs of the total annual immigrant lepidoptera (29 species) reported in Williams (1958) for 1855-1955 were correlated with three proximal climatic variables: Manley's (1974) temperature for Midland England (T), Gloyne's (1973) length of growing season in southern Scotland (L), and Trenkle's (1956) geostrophic west wind (W) component of the Atlantic-European zonal circulation index; and with the distal variable of annual relative sunspot numbers ( $R_s$ ). Use of 11-year moving averages eliminated 11-year solar cycle effects in all series. Log migrants correlated .96 with L, -.65 with W, .60 with T, and .53 with  $R_s$  (all  $p$ 's  $< .001$ ). Differences in series lengths and overlap precluded meaningful partial correlational analyses; but prior studies (Willet, 1964; Lamb, 1977) support solar control over these climatic variables and hence probably over lepidoptera migration, as well. Breakdown of the 29 species of lepidoptera into butterflies, hawkmoths and other moths yielded nearly identical results since the intercorrelation of these three series were .84-.93 ( $n = 96$ ,  $p < .001$ ).

- 9:45 FURTHER EVIDENCE OF REVERSAL IN SOLAR-TERRESTRIAL CORRELATIONS AT THE GLEISSBERG MINIMUM: BRITISH MIGRANT LEPIDOPTERA John F. Wing, Steve McFarland, and Eric Johnston, Departments of Biology and Psychology, Wittenberg University, Springfield, Ohio 45501.

Wing (1982) reported a reversal in phase relation between the 11-yr. sunspot cycle and log number of lepidoptera collected by Schwerdtfeger (Varley, 1949) for the 60-yr. period 1880-1940 such that a normally positive correlation became negative during the Gleissberg solar minimum (solar cycles 12, 13 and 14). This study shows that when long-term trends are removed from British migrant lepidoptera data taken from Williams (1958), they also show this effect. Analysis of residuals about linear trend lines showed they were in phase with the 11-yr. cycle before the Gleissberg ( $r = .61$ ,  $n = 21$ ,  $p < .005$  for solar cycles 10-11), out-of-phase during and just after the Gleissberg ( $r = -.42$ ,  $n = 48$ ,  $p < .005$  for cycles 12-15) and then in-phase again ( $r = .57$ ,  $n = 31$ ,  $p < .001$  for cycles 16-17). The cause of this reversal in phase relations during the Gleissberg minimum must be the sun itself since the auroral oval shrinks then, as evidenced by a retreat in aurorae reported in both southern Sweden and southern Canada (Feynman & Silverman, 1980), and by a simultaneous reversal in the phase relation of the sunspot cycle with atmosphere pressure over Iceland (Clayton, 1943). These reversals may also be related to the failure of the sun to reverse its magnetic field at the beginning of every Gleissberg minimum (Willet, 1976).

- 10:00 SEX DETERMINATION OF POPILIUS DISJUNCTUS ILLIGER FROM BODY AND HORN DIMENSIONS. Dr John F Tafuri and Francis X Tafuri, Xavier University, 3800 Victory Parkway, Cincinnati OH 45207-1096.

Although much research has been done on the beetle, Popilius disjunctus illiger, the only existing reliable method for determining the sex of an individual in a population is by sacrificing the animal and examining it anatomically. It has been established previously that within a population, the average body length of females is greater than the average body length of males, but no formal correlation studies present body length as a predictor for sex determination.

This study uses correlation determinations between body length, horn dimensions, and sex to present evidence for harmonic horn growth within each sex. Further, statistical treatment of the data obtained suggests that such values may be used to predict individual sex without sacrificing the beetle.

From four measurements made on each animal (total body length, horn length, horn width, and horn height), differences in the sample means between sexes indicate that females are greater than males in all four categories. By combining measurements into ratios, highly significant differences between mean ratios additionally permit prediction of sex from comparison with confidence intervals for horn-to-body length, area-to-body length, and horn "volume" to body length ratios.

- 10:15 ELECTROPHYSIOLOGICAL EFFECTS OF CALCIUM MODULATING DRUGS ON COCKROACH NERVE CORDS. K. M. Hoffman and G.F. Shambaugh, Department of Entomology, Ohio Agricultural Research & Development Center, Ohio State University, Wooster, OH 44691

A number of compounds were tested on nervous activity in the cockroach sixth abdominal ganglion. The sucrose gap technique was employed to monitor the electrical responses. Components of both spontaneous and evoked activity were recorded. Srontium and pentylenetetrazol both increased activity. Sodium azide, hydroxylamine, and carbaryl increased activity at first, but then caused a high frequency block. Phenytoin, n-propyl-aminoindene, verapamil, and atractyloside all decreased nervous activity. The effects of these compounds on calcium and c-GMP levels in the nerve cells and their relationships with nervous system function and possible insecticidal action will be discussed.

- 10:45 THE USE OF AVIAN SEROSURVEYS FOR THE DETECTION OF ST. LOUIS ENCEPHALITIS VIRUS ACTIVITY. Lee Mitchell, Toledo Area Sanitary District, 5015 Stickney Avenue, Toledo, Ohio 43612

Investigations to determine the level of avian exposure to St. Louis Encephalitis (SLE) virus were conducted in Lucas County, Ohio, in 1981 and 1982. Japanese mist nets were used to capture avians, which were predominately house sparrows (Passer domesticus L.), from June through August during both years. Captured avians were identified to species, aged, sexed, leg banded, blood sampled and released. The Hemagglutination Inhibition (HI) test and the Plaque Reduction Neutralization Test (PRNT) were utilized for the detection of SLE antibodies in blood

samples. There were no positive avian samples (0/481) in either of the study years and these results were in agreement with the low level of SLE activity reported for Ohio ( $X = .17\%$ ) and other midwestern states during this period.

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## A. ZOOLOGY

FIRST AFTERNOON SESSION, SATURDAY APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 229

E. BRUCE MCLEAN, PRESIDING

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### 1:30 BUSINESS MEETING

2:00 EVIDENCE FOR THE ARGININE REQUIREMENT IN THE DARK-EYED JUNCO, JUNCO HYEMALIS. Michael D. Westerhaus and Elden W. Martin, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Four purified diets consisting of differing levels of arginine were fed to wild Dark-eyed Juncos in a laboratory situation for seven weeks. Specific symptoms of an inadequate intake of dietary arginine were identified in relation to the gross protein content of the carcass and feces, muscle creatine, variations in feather tyrosinase and quantitative variation of amino acids in standard tissues. A precolumn technique utilizing reverse-phase high performance liquid chromatography with o-phthalaldehyde as a precolumn derivatizing reagent was used for the determination of amino acid composition. Tissues chosen for analysis included the liver, spleen, heart and pectoralis muscle. While dry weight food consumption per gram of bird declined significantly ( $P < 0.01$ ) with increased dietary arginine, body weight increased and feather tyrosinase activity increased. Variations in specific tissue amino acids and muscle creatine levels will be discussed to show further effects of dietary levels of arginine.

2:15 AFFECTS OF STROBOSCOPIC ILLUMINATION ON RESPONSE TO OPTOKINETIC STIMULATION DURING DEVELOPMENT OF THE CHICKEN (GALLUS GALLUS). Beth Hansbrough, Dept. Zoology; Donald Parker, Dept. of Psychology; David R. Osborne, Dept. Zoology, Miami University, Oxford, OH 45056.

In order to examine the affects of retinal slip on the maintenance of oculomotor responses, newly hatched chicks were reared in a stroboscopically lit environment. The strobe light functioned to eliminate visual motion cues associated with retinal slip. Ten one-day old chickens were placed on a 12 hour L/D cycle for ten days: five control chicks were exposed to continuous, low-level illumination during the light phase and five experimental chicks were exposed to stroboscopic illumination for five days. During the final five days all chicks were exposed to continuous illumination. When exposed to optokinetic stimulation, which was provided by a rotating drum (0.1 Hz) with vertical black stripes on its inner wall, a reflexive head nystagmus was exhibited. The results show a divergence between the two groups, with controls exhibiting fewer nystagmus beats than experimentals during the final two days of testing. This led to the conclusion that rearing in a stroboscopically lit environment caused maturation of the visual system in birds to be retarded.

2:30 AGE-SPECIFIC DIFFERENCES IN SONG USE BY CAROLINA WRENS (THRYOTHORUS LUDOVICIANUS). Barbara S. Simpson, Department of Biology, Case Western Reserve University, Cleveland, Ohio 44106.

Two experiments with captive Carolina wrens compared the use of song in territorial interactions by first-year birds (HY) and older birds (AHY). I utilized a new experimental protocol whereby male subjects were captured and housed with their mates in portable cages on their own territories. By moving each cage to sites in the resident's territory, I tested the effects of distance from playbacks or distance from conspecifics; I controlled the location of each bird in his territory and the proximity of each bird to his mate. The experiments were conducted in fall when the songs of territorial HY and AHY birds cannot be separated by ear or by comparison of sound spectrograms.



The first experiment tested vocal response to playbacks located 25m or 165m from the subject. At both distances HY birds responded more strongly than AHY birds. The second experiment tested song use as a function of spacing. Two pairs of adjacent territory holders were simultaneously moved to sites 140m, 80m, 20m, or 0m apart. At all distances HY birds sang more songs, used larger repertoires of song types, and switched song types more frequently. These results suggest that a young bird without benefits of prior experience of a territory might invest more energy in activities, such as song, associated with maintaining territorial boundaries.

- 3:00 Capture Techniques for Screech Owls and Barn Owls  
Bruce A. Colvin, Center for Environmental Research and Services, Bowling Green State University, Bowling Green, Ohio 43403 and Paul L. Hegdal, U.S. Fish and Wildlife Service, Building 16, Denver Federal Center, Denver, Colorado 80225

Capture of screech owls (*Otus asio*) and barn owls (*Tyto alba*) was required for ongoing studies of secondary poisoning hazard due to rodenticide use, as well as for components of owl behavior, management, and population dynamics. A total of 72 captures were made of 46 different screech owls in Fredrick County, Virginia. Thirteen captures were made 25 to 31 May 1982 and all others between 25 October 1981 and 12 January 1982. Principal capture method consisted of playback of screech owl vocalizations from mist net (10.2 cm mesh) placements in or adjacent to orchards. Other methods included regular checks of 144 nest boxes, empty mist net, mist net with tethered pigeon, tree cavity checks, and mist net with vole distress recording. These methods resulted in 42, 17, 5, 4, 3, and 1 captures respectively. A total of 111 (99 adult, 12 hatching year) captures of 89 different barn owls were made during the summers of 1980, 1981, and 1982. Five captures were made in Ohio in 1981. All others (106) were made in southwest New Jersey. Barn owls were captured with mist nets or long handled hoop nets fitted with mist netting. Mist nets were placed in owl flight paths in farm yards, barn rafters, and silo tops. Hoop nets were used at night to cover openings in barns and entrances to tree cavities once an owl had entered. Day captures were made by placing hoop nets over barn, silo top, or tree cavity exists and then flushing roosting owls. All owls were banded, and 38 screech owls and 48 barn owls were radio-equipped.

- 3:15 CAPTIVE BEHAVIOR OF THE SHORT-TAILED SHREW (*BLARINA BREVICAUDA*).  
Patricia A. Duncan, Department of Biology, University of Cincinnati,  
Cincinnati, Ohio 45221.

A burrowing mammal's behavior must often be examined in captivity due to the difficulty of examining it under natural conditions. This study examined *Blarina brevicauda*'s behavior in captivity. Three areas of interest were investigated. First, the question of whether or not *B. brevicauda* could be kept in captivity for any length of time. This was possible by providing plenty of water, either dirt or sawdust bedding and most importantly, a high protein diet. A second area examined was social behavior. Colonies were formed when competition over food, water and space was virtually eliminated. Thirdly, interspecific relations were of interest. Stomach contents of shrews often included the remains of mice. In the present study, a laboratory mouse has been living with and sharing food, water and bedding areas with two shrews for six months. Coexistence of mice and shrews within a confined area is therefore possible in the absence of competition over food and water.

- 3:30 PSYCHEDELIC OPOSSUMS: FLUORESCENCE OF THE SKIN AND FUR OF *DIDELPHIS VIRGINIANA* KERR. Donna H. Meisner, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

While fluorescence of the integument on exposure to ultraviolet radiation has been noted in a number of mammals, it is especially pronounced in the Virginia opossum (*Didelphis virginiana* Kerr). Examination of 20 anesthetized adults under medium- to long-wave UV light revealed patterns and colors of fluorescence of the skin, hairs, and skin secretions that are more complex than those reported for several other marsupials. A lack of consistent sexual differences in fluorescence patterns in this species contrasts with the marked dimorphism seen in staining of fur by sternal skin gland secretions visible under normal light. The possible relationship between fluorescence and substances used by this opossum in olfactory communication will be discussed.

- 3:45 PHYSIOLOGICAL AND BIOCHEMICAL CORRELATES OF TORPOR IN *PEROGNATHUS CALIFORNICUS*.  
Jeffrey Merritt, Department of Biological Sciences, Bowling Green State University,  
Bowling Green, Ohio 43403.

Several physiological and biochemical features of torpor in the California pocket mouse, *Perognathus californicus*, were investigated. Thermal conductance, patterns of entry into and arousal from torpor were determined by open-flow respirometry at ambient temperatures of 10° and 15°C. Adenosine triphosphate (ATP) concentrations of heart and liver tis-

sues were investigated in both normothermic and hypothermic P. californicus and compared with those of Mus musculus.

Conductance and critical temperatures for arousal in this population were found to be significantly different when compared to a population 500 km south. Those differences presumably arise from and relate to the different environmental conditions encountered by the two populations.

Heart and liver ATP levels were determined in animals exposed to different ambient temperatures and having different body temperatures, by a luciferin-luciferase photometry technique. Hypothermic animals had elevated hepatic ATP levels and normothermic levels in the heart, conditions which parallel those of long-term hibernators. This study provides evidence that P. californicus, an animal which uses short-term, sporadic torpor, has homologous biochemical adaptive strategies to true hibernators.

## A. ZOOLOGY

SECOND AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 227

DAVID H. STANSBERY, PRESIDING

1:30 BUSINESS MEETING ROOM 229 LIFE SCIENCES BLDG.

2:00 PRELIMINARY INVESTIGATIONS OF THE USE OF OLD WOMAN CREEK ESTUARY BY LAKE ERIE FISHES. Randy Deeher and Beverly Owen, Old Woman Creek National Estuarine Sanctuary, 2514 Cleveland Road E., Huron, Ohio and Fred L. Snyder, Fremont Area Extension Center, 1401 Walter Avenue, Fremont, Ohio.

Thirty-three fish species were identified, representing species typical of open-lake, marshlike and stream habitats. Species diversity and individual abundance were greatest in the lower and upper reaches of the estuary and lowest in the shallow, open water central areas. Selected game species (Morone chrysops, Morone americana), and forage species (Dorosoma cepedianum) appear to be utilizing the estuary as a nursery. Yoy (young-of-year) Perca flavescens and Stizostedion vitreum were also found in the estuary in limited numbers.

2:15 COMPARATIVE FOOD HABITS OF YOUNG WHITE PERCH (MORONE AMERICANA (GMELIN)) AND WHITE BASS (MORONE CHRYSOPS (RAFINESQUE)) IN OLD WOMAN CREEK ESTUARY. Beverly Owen and Randy Deeher, Old Woman Creek National Estuarine Sanctuary, 2514 Cleveland Road E., Huron, Ohio and Fred L. Snyder, Fremont Area Extension Center, 1401 Walter Avenue, Fremont, Ohio.

Bi-weekly seine collections of white perch and white bass were made in Old Woman Creek Estuary between May and December, 1982. These collections provided base-line data on the usage of the estuary by the two species and their individual food habits. The predominance of yoy (young-of-year) and yearling fish of both species in the seines would indicate that these two species are using the estuary as a nursery area. Both yoy and yearling white perch feed opportunistically on food items which were seasonally abundant. Yoy and yearling white bass were found to be almost entirely piscivorous. These preliminary findings suggest little or no direct competition for food between the native white bass and the alien white perch in this area.

2:30 SYSTEMATIC RELATIONSHIPS OF THE CYPRINID TAXA HYBOPSIS (EXTRARIUS) AESTIVALIS, HYBOPSIS (ERIMYSTAX) SPP., AND PHENACOBIVUS. Miles Coburn, John Carroll University University Hts., OH 44118.

Eight North American cyprinid genera including Notropis, Ericymba, Pimephales, Hybognathus, Hybopsis (Hybopsis) spp., H. (Erimystax) spp., H. (Extrarius) aestivalis, and Phenacobius share the synapomorphy of a ventral opening in the

floor of the posterior myodome. The last three appear to form a monophyletic subunit within this group. These three taxa share several synapomorphies: the transverse process on the 4th Weberian rib is heavy, and the peritoneal tunic extending inward toward the os suspensoria undergoes some ossification; the dentary has a short downwardly deflected gnathic ramus, and a high coronoid process; the metapterygoid has a single articular process with the hyomandibula instead of a double process; the ascending arm of the preopercle is reduced and the horizontal arm is long; and the mesial margin of the third pharyngobranchial is deeply concave. Jenkins and Lachner (1971:11) proposed a relationship between Phenacobius and Erimystax; however several synapomorphies are shared between Phenacobius and Extrarius, and indicate they may be sister groups. These include: a short, almost triangular basihyal; stubby, blunt anterior processes on the urohyal; a dorsal process of the anterior ceratohyal projects over the upper hypohyal; the efferent pseudobranchial artery is always enclosed in the ascending wings of the parasphenoid in Phenacobius and often included in Extrarius, but is not in Erimystax; both taxa have a dorsoposterior prong on the metapterygoid for the attachment of the M. levator arcus palatini, and this is lacking in Erimystax.

- 3:00 CLAMP WALL ULTRASTRUCTURE OF MICROCOTYLE SPINICIRRUS (MONOGENEA).  
John C. Mergo, Jr., John L. Crites, and Carl T. Singley.  
Department of Zoology, The Ohio State University, Columbus, Ohio,  
43210.

Ultrastructural examination of the clamp wall of Microcotyle spinicirrus reveals three distinct tissue layers; an inner tegumental layer, an outer tegumental layer, and a muscle layer between the two teguments. The outer tegument, despite being continuous with the inner tegument, differs in ultrastructure. The external tegument possesses extensive folds or ridges, a higher number of mitochondria, and more electron lucent inclusion vesicles than the inner tegument. These observations indicate a possible absorptive function of the external tegument. The muscle layer is bound internally and externally by a basement membrane. Bundles of myofilaments, surrounded by a sarcoplasmic reticulum, attach to dome shaped attachment plaques along the basement membrane. Contraction of myofilaments may produce a suction in clamp causing clamp to function as a reinforced or armored sucker.

- 3:15 A CALANOID COPEPOD AS INTERMEDIATE HOST OF AN ACANTHOCEPHALAN.  
Jerry H. Hubschman, Biological Sciences, Wright State University  
Dayton, Ohio 45435.

Acanthocephala parasitizing freshwater fishes require crustaceans as intermediate hosts. Most species reported in North America utilize ostracods, amphipods, or isopods, although some may be carried by copepods. In the latter case only Cyclopoid copepods have been recorded to harbor the infective stages. I report here the occurrence of Tanaorhamphus longirostris (Van Cleave, 1913) in the Calanoid copepod Diaptomus pallidus Herrick 1879.

During the summer of 1981, systematic zooplankton sampling was conducted on Caesar Creek Lake (Warren, Clinton, and Greene counties in Ohio). Numerous specimens of D. pallidus were found to contain larval and juvenile worms in the body cavity. Larval and juvenile forms were found in May and June, with well-developed (infective) juvenile forms in late June. Juvenile worms have been recovered from the following fishes: Bluegill Sunfish (Lepomis macrochirus) Bluntnose Minnow (Pimephales notatus), Gizzard Shad (Dorosoma cepedianum) Spotfish Shiner (Notropis spilopterus), White Crappie (Pomoxis annularis). Adult worms have been recovered only from the Gizzard Shad.

- 3:30 A SURVEY OF CESTODES FROM THE CLIFF SWALLOW IN COLORADO.  
Jeffrey D. Stamper and Gerald D. Schmidt. University of  
Northern Colorado. Greeley, Colorado 80631.

One hundred and forty-five cliff swallows were collected from two separate surveys in Weld County, Colorado. The birds were thoroughly examined for cestodes. Seven species representing four genera were collected. A new species of Angularella (Dilepididae) is described. The smaller size of the rostellator hooks (8.4-13.5 micrometers) and the medial relationship of the cirrus pouch to the osmoregulatory canals distinguishes this species from the four other known species of Angularella. Other species of

cestodes collected: Angularella beema, Anoncotænia globata, Maynewia ababii, Vitta magniuncinata, Vitta parvirostris and Vitta riparia. Seven new host records, as well as seven new Colorado and six North American geographic distribution records were established.

- 3:45 CELLULAR REACTIONS IN THE LUNGS OF NEONATAL THYMECTOMIZED GUINEA PIGS (CAVIA PROCELLUS) INFECTED WITH PARASCARIS EQUORUM. Lisa McKay and Francis Rabalais, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Histological sections of the lungs of neonatal thymectomized guinea pigs were examined to determine the reaction to larval migration of Parascaris equorum. The sections revealed considerable consolidation of interstitial tissue, congregation of various sub-populations of leucocytes (particularly eosinophils), giant cells, considerable hemorrhage and accumulation of hemosiderin. By contrast, control animals (infected but not thymectomized) received less damage to the lungs and the leucocytic response was mild relative to the experimental group.

## B. PLANT SCIENCES

FIRST MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 224

EMANUEL D. RUDOLPH, PRESIDING

- 8:30 THE NORTHERN RANGE OF PHORADENDRON SEROTINUM (LORANTHACEAE); EASTERN FALSE MISTLETOE, AND ITS STATUS IN OHIO. David M. Spooner, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

The northern limits of Phoradendron serotinum have often been believed to have been determined by cold temperatures. A map of the northern range of this species, from Long Island to Missouri, was constructed from herbarium specimens and published records. This northern limit is correlated with the number of frost free days (ca. 180 frost free days/year). Areas where the climatological data do not fit the distribution of the species (i.e. in West Virginia and southern Pennsylvania) are due to its occurrence in protected sites. Field work in Ohio has demonstrated that the majority of the present-day distribution is along the Ohio River from Washington County downstream, in areas that are kept relatively mild by the moderating effect of the river. The most northern inland records in the state are in Athens, Ross, and Vinton Counties, but these populations are believed extirpated. A disjunct Cuyahoga County record mentioned by Trelease (1916) is possibly in error; the specimen has not been located. This species is here reported from five additional host species not recorded for Ohio: Celtis occidentalis L., Gleditsia triacanthos L., Juglans nigra L., Prunus serotina Ehrh., and Robinia pseudo-acacia L. The Ohio distribution has undergone reduction in recent years due to over-collecting, cutting of host trees, and the severe winters of 1977-1978.

- 8:45 MORPHOLOGICAL VARIATION AND DISTRIBUTION OF GRATIOLA VISCIDULA (SCROPHULARIACEAE). David M. Spooner, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Gratiola viscidula Pennell is currently documented from 86 counties in the Piedmont and adjacent Atlantic Coastal Plain and southern section of the Blue Ridge Province. In addition, disjunct populations are located farther west, to the Ozark Plateau in southeastern Missouri and the Allegheny Plateau in southeastern Ohio and adjacent Kentucky and West Virginia. This species was separated into two subspecies by Pennell in 1935: G. viscidula subsp. viscidula, and G. viscidula subsp. shortii Durand ex Pennell. This latter subspecies, which was distinguished by its larger calyces, petals, and leaves, was believed to be confined to southeastern Ohio and adjacent Kentucky and West Virginia. In the recent literature it has been erroneously referred to as G. viscidula var. shortii (Durand) Gleason, and as G. viscidula var. shortii (Pennell) Gleason. Herbarium specimens have been examined from throughout the range of the species, and mass collections were made in Ohio, Kentucky, and West Virginia. Examination of this material has demonstrated that the sizes of petals, calyces and leaves are highly variable both throughout the range of the species and within individual populations. Subspecific categories are unwarranted.

- 9:00 SIDA HERMAPHRODITA (MALVACEAE); VIRGINIA MALLOW, A COMMON RARITY. David M. Spooner and George F. Hall. Department of Botany, Department of Agronomy, The Ohio State University, Columbus, Ohio 43210.

Sida hermaphrodita Rusby is an uncommon species distributed along a number of streams in the e. U.S. It was considered at one time as a federally threatened species, but was subsequently withdrawn from consideration. Hypotheses presented for its possible rarity included unique soils types and low seed germination potential. Results of this study demonstrate that while uncommon, especially in areas east of the Appalachian mountains, it is locally common along the Kanawa and Ohio Rivers in WV, ne. KY, and se. OH. In addition, there is an extensive population in nw. OH (Williams County). This record and other historical records for the area (including s. MI) may well represent native populations, an hypothesis at variance with previous interpretations. All populations occur in open pioneer habitats, in natural situations, such as openings along stream edges and flood-created openings, and also in artificial situations, such as cleared roadsides and artificial fill. From the available data, soils are apparently not a factor limiting the distribution of the species. It grows in widely distributed soils with medium texture, high to medium organic matter, and a high pH. The seeds from throughout the range of the species are highly viable and readily germinate (over 80%) when scarified. The populations to the west of the Appalachians are apparently expanding their range and are not in need of federal protection. The chromosome number ( $2n=28$ ) is here reported for the first time.

- 9:15 STATUS OF OHIO PLANTS CONSIDERED FOR FEDERAL LISTING. A.W.Cusick<sup>1</sup>, D.M.Spooner<sup>2</sup>, B.K.Andreas<sup>3</sup>, D.M.Anderson<sup>1</sup>. 1)ODNR, Cols.,OH,43224. 2)Dept. Botany, The Ohio State Univ., Cols.,OH, 43210, 3) Dept. Biol., Cuyahoga Community Coll., Cleveland, OH 44142

Twenty native Ohio plant species were considered for listing as federally threatened or endangered by the U.S. Fish and Wildlife Service. The Ohio Dept. of Natural Resources, Div. of Natural Areas and Preserves, was contracted by the Service to assess their statewide rarity, taxonomic status, and threats to extirpation. Our recommendations to the Service regarding these species are: 1) List or retain as federally threatened: Aconitum noveboracense; Calamagrostis insperata; Plantago cordata; Platanthera leucophaea. 2) Although these taxa are rare or extirpated in Ohio, a recommendation is unable to be made at this time due to insufficient data on the status or vulnerability of these taxa elsewhere: Poa paludigena; Potamogeton hillii; Synandra hispidula; Trollius laxus; 3)Withdraw from consideration at this time, but periodically monitor their status: Cypripedium candidum; Veratrum woodii. 4) Do not list until disputed taxonomic problems are resolved: Polygonum pennsylvanicum var. eglandulosum; Rhus trilobata var. arenaria; Trollius laxus. 5) Withdraw from consideration from federal listing, as these taxa are frequent throughout much of their ranges and are in little danger of extirpation: Panax quinquefolius; Platanthera flava; Platanthera peramoena; Polemonium reptans var. villosum; Sullivantia sullivantii. 6) Withdraw from consideration, as these taxa do not meet the definition of a "species" under the Endangered Species Act: Asplenium Xebenooides, Asplenium Xkentuckiense; Muhlenbergia Xcurtiseta.

- 9:30 EDWIN L. MOSELEY, INTERNATIONALLY KNOWN NATURALIST, AS VIEWED BY THOSE WHO KNEW HIM. Relda Niederhofer, Natural and Social Sciences Department, Firelands College, Bowling Green State University, Huron, Ohio 44839.

Edwin Lincoln Moseley was an internationally known naturalist whose accomplishments ranged from the discovery and cure for trembles to tracing the pre-glacial valley through Sandusky Bay. Born in 1865 at Union City, Michigan, where he completed high school by age fifteen, Moseley received both the Bachelor's and Master's degrees in four years from the University of Michigan. After teaching for two years in Grand Rapids High School, Michigan, he joined the Beal-Steere Zoological Expedition to the Philippines. Moseley returned with a nucleus of specimens which, when greatly expanded through prodigious collecting through the years, developed into one of the finest museums in the country at Sandusky High School, where he taught for twenty-five years. Appointed in 1914 as an original faculty member of Bowling Green Normal School, by the first president, Dr. H.B. Williams, former Superintendent of Sandusky Schools and Moseley was the science department teaching chemistry, physics, biology, and geology. He retired in 1935 as Professor Emeritus of Biology and remained as Curator of the University Museum until his death. In 1943 Moseley was awarded the degree of Doctor of Humane Letters, the first Bowling Green State University faculty member to be so honored. At his death in 1948 his entire estate of \$100,000 was left to Bowling Green State University to aid worthy students in pursuit of an education.

He was the author of three books and numerous articles. He was a member of The Ohio Academy of Science (Secretary 1895-1903; President, 1904) and numerous other professional societies.

- 9:45 EDWIN LINCOLN MOSELEY'S CONTRIBUTIONS TO SCIENCE. Ronald L. Stuckey, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Edwin Lincoln Moseley (1865-1948), whose professional career in Ohio spanned nearly 60 years as a high school science teacher in Sandusky until 1914 and as a professor of science at the Bowling Green Normal College until his death, made significant con-

tributions to several disciplines of science. Working alone or with help from his many loyal and devoted students, he made a number of original observations relative to the natural world, while at the same time provided an atmosphere for creative and independent thinking in his students. As an author of three general science textbooks and over 100 articles in professional and popular journals, Moseley's contributions were in botany, geology, meteorology, medical science, science education, and zoology. Among these contributions were his (1) catalogues of the vascular plants of two of northern Ohio's most diverse floristic areas, the island and Sandusky Bay region of Lake Erie and the Oak Openings west of Toledo; (2) description of the formation of Sandusky Bay and Cedar Point and preparation of a map of the pre-glacial river valleys in that area; (3) long-range weather forecasts for the eastern part of the United States, based on detailed studies of tree-ring widths and lake-level records through which he formulated a theory that amounts of rainfall in certain areas repeat in cycles of 90.4 years or four times the period of the magnetic sun-spot cycle; and (4) the first satisfactory experiments to demonstrate that trembles in animals results from their grazing on a common woodland plant, white snakeroot, and that the poison enters the milk causing the disease known as milk sickness in human beings.

- 10:00 SOIL PROPERTIES AND COMMUNITY DISTRIBUTIONS ON SERPENTINE AREAS OF PENNSYLVANIA AND MARYLAND. Kevin W. Dougherty and John L. Vankat, Department of Botany, Miami University, Oxford, Ohio 45056.

Outcrops of serpentine occur as a discontinuous series of ridges in southeastern Pennsylvania and north central Maryland. Soils derived from this ultra-basic metamorphic rock support unusual floras and distinctive plant communities. Hypotheses based on chemical and physical properties of these soils have been offered to account for the diversity and distribution of plant communities. To test these hypotheses, soil samples and vegetation data were collected from eight localities representing the three major serpentine ridges in the eastern United States. Soil cores were subdivided into five depth increments and analyzed for selected chemical and physical properties. Classification and ordination of vegetation data from releves and line transects were performed using TWINSpan, DECORANA, and ORDIFLEX computer programs. Classification procedures have tentatively identified four grassland, two forest and one open barrens communities. Preliminary results indicate correlations between ordination axes and subsoil pH, soil depth and organic phosphorous concentrations.

- 10:15 A BRIEF HISTORY OF PLANT PERSONIFICATION. Emanuel D. Rudolph, Department of Botany, Ohio State University, Columbus, Ohio 43210.

The earliest documented use of attributing human characteristics to plants was for magical or supernatural purposes as with the mandrake plant by certain herbalists. In the 18th century, when natural history was more analytical, the famous naturalist Linnaeus used personification of floral parts for instructional purposes. Erasmus Darwin, later in the century, elaborated on that technique for the same purpose, and some children's book writers in the next century used plant "people" for instructional purposes. Moralistic use for personified plants was used by several authors. Most of them did so in poetical or allegorical ways, however J. E. Taylor in his book The Sagacity and Morality of Plants of 1884 is serious in intent. Magical, instructional, and moralistic reasons for personifying plants are now period pieces. However, their use for entertainment purposes is still practiced. In the 19th century, two author-illustrators found personified plants ideal for their purposes. The Frenchman J. J. Grandville used them to satirize people, and the Englishman Edward Lear used them in his whimsical works. Many others followed their lead and examples are abundant for both children and adults. Only in science fiction or fanciful science do authors now seriously attribute human characteristics to plants. This survey illustrates a little used technique of the human imagination which relates to botanical science in an interesting, but tangential way.

- 10:30 NEW DIRECTIONS IN BOTANICAL NOMENCLATURE. Edward G. Voss, Univ. of Mich. Herbarium, North Univ. Bldg., Ann Arbor, Mich. 48109.

Several changes adopted at the XIII International Botanical Congress (Sydney, 1981) will be incorporated into the new edition of the International Code of Botanical Nomenclature, now in press: Conservation of names of species is allowed, but only species "of major economic importance." Procedures for rejecting names under Art. 69 (misapplications) are refined. The status of orthographic variants of a name is clarified, only one of them being validly published. The type of a generic name is not a species, but is ordinarily the same (i.e., a specimen) as for a species definitely cited in the protologue. Provisions for autonyms are completely rewritten; a major change declares that autonyms are validly published and take priority over the name(s) of the same date that created them. The practical effect of this is important when species are united and the one with the later name has a named infraspecific taxon which no longer provides the basionym for a new combination at the same rank. The starting-point date for all fungi is 1 May 1753 (Linnaeus), but certain names of Persoon and Fries have a "sanctioned" status which is similar to conservation. The word nothotaxon (as well as nothospecies, etc.) is introduced into a remodelled Appendix on hybrid nomenclature, and nothomorph is dropped.

## B. PLANT SCIENCES

SECOND MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 222

MICHAEL O. GARRAWAY, PRESIDING

- 8:30 CORRELATION OF CHANGES IN SUCROSE TRANSLOCATION AFTER A SHORT DARK PERIOD WITH CHANGES IN SOURCE LEAF CARBOHYDRATES; C.A. Swanson and J.J. McFadden; Botany Department, Ohio State University, Columbus, Ohio, 43210.

Previous studies on sucrose translocation in bean plants have shown that there was a lag in the recovery of sucrose translocation after a short dark period, though photosynthetic rates recovered rapidly (Borchers-Zampini et al., Plant Physiol. 65, 1116-1120, 1980). This study was undertaken to document changes in source leaf carbohydrates associated with the lag in recovery of translocation noted in the previous study. A combination of fluorometric enzyme assays and gas chromatography of oxime-silylated sugars was used to follow changes in source leaf carbohydrate levels in experiments that used light treatments similar to those used in the previous work. A decrease in starch accumulation rates is noted after the short dark period, accompanied by increases in sucrose and maltose levels. These changes are discussed in relation to the evidence for regulation of starch accumulation by the triose phosphate /inorganic phosphate ratio and the possible requirement for maltose primer in starch synthesis.

- 8:45 CONTROL OF COLEOPTILE ELONGATION WITH SHORT, SINGLE EXPOSURES TO WHITE LIGHT IN ZEA VARIETIES. Amy Jo Smith and Bernard C. Mikula Defiance College, Defiance, Ohio 43512

Five lines of sweet corn were analyzed for coleoptile and epicotyl elongation responses to white light of approximately 1000 ft. candles (26°C.). Single light periods of  $\frac{1}{2}$  to 24 hours duration administered to seedlings 12-96 hours old provided seven day-old coleoptiles which measured up to three times those of dark controls. Coleoptile elongation is related to the length of the light period as well as the age of the seedling at the time of light exposure. The degree of inhibition of coleoptile elongation varies with the line of corn and increases with the length of the light period especially during the third and fourth day of germination. Since some light treatments are administered to seedlings before coleoptile emergence from the pericarp, elongation may be programmed quite early with developmental memory from these brief light periods carrying over several days. Epicotyls measured longer than dark controls in two of the five lines only when light treatments were given before 48 hours. Most light treatments result in reduced elongation for both coleoptiles and epicotyls. Elongation response in coleoptiles is independent of those of epicotyls; the same light treatments which cause coleoptiles to elongate maximally, result in as much as 50% inhibition in epicotyl length. It is proposed the above coleoptile behavior demonstrates a light sensitivity comparable to classical Avena phototropic responses which have occupied the attention of plant physiologists since the 1920's. The advantage of the above is that no "safelight" manipulation is required and coleoptiles need not be excised for assay purposes.

- 9:00 AN ANALYSIS OF GIBBERELIC ACID AND ABSCISIC ACID CONTENT IN SEEDS OF FRAXINUS AMERICANA L. Charles L. Stinemetz and Bruce R. Roberts, Department of Botany-Bacteriology, Ohio Wesleyan University, Delaware, Ohio 43015.

Using HPLC techniques, the content of gibberellic acid (GA) and abscisic acid (ABA) was examined in white ash seeds (Fraxinus americana L.) ranging in age from 1 to 10 years. The youngest seeds exhibited the highest level of GA, after which the GA content decreased rapidly. The greatest concentration of ABA was found in 4-yr-old seed. Germination tests conducted to determine if older seeds would germinate with less exogenously-applied GA than younger seeds showed that germination rate could be enhanced in older seeds with lower concentrations of exogenous GA. Furthermore, the germination of seeds receiving no exogenous GA showed a higher positive correlation to fluctuations in the GA/ABA ratio. Thus, the initiation of germination in white ash seeds appears to be regulated by the relative concentrations of GA and ABA.

- 9:15 LOCALIZATION OF POLYPHOSPHATE BODIES AND ACID PHOSPHATASE ACTIVITY IN NOSTOC SP.  
John D. DuBois, Keith R. Roberts and Lawrence A. Kapustka, Botany Department, Miami University, Oxford, Ohio 45056.

Polyphosphate bodies (PPBs) are known to form when excess  $P_i$  is present. The Utilization of these orthophosphate polymers occurs as phosphate becomes limiting relative to the rate of growth. Acid phosphatase (Ac Pase) is the principle enzyme responsible for the hydrolysis of PPBs. The objective of this study was to characterize the PPBs and the Ac Pase activity to determine if the hydrolysis of PPBs could supply energy to the  $N_2$ -fixation system in Nostoc sp. during times of energy stress. Localization of PPBs and Ac Pase was accomplished following standard fixation techniques along with 72 h light or dark incubations with or without p-nitrophenyl phosphate (PNP), an exogenous substrate for Ac Pase. Ac Pase activity was assayed using PNP and measuring p-nitrophenol produced. Cells incubated in the light showed Ac Pase activity localized around the perimeter of PPBs. When incubated in the dark, Ac Pase activity occurred throughout the PPB matrix, however, complete hydrolysis of PPBs did not occur and the level of Ac Pase activity was not affected. Since  $N_2$ -fixation activity is undetectable after 24 h in the dark and PPBs and Ac Pase activity are still present, we conclude that PPBs and Ac Pase do not serve as an energy source for  $N_2$ -fixation in Nostoc sp.

- 9:30 THE LATENT PERIOD FOR SHOOT-INVERTED RELEASE OF APICAL DOMINANCE IN PHARBITIS NIL. Morris G. Cline and Lori Riley.  
Botany Department, Ohio State University, Columbus, OH 43210.

When the upper portion of the shoot of Japanese Morning Glory (Pharbitis nil) is inverted, the highest lateral bud near the bend of the stem grows out and takes over as the lead shoot. The growth of the lowered terminal bud decreases. The latent period for the initiation of this shoot-inversion release of apical dominance appears to be two days (light intensity: 250-800  $\mu E\ m^{-2}sec^{-1}$ ). If the shoot is maintained in the inverted position for less than 7 days, the growth of the highest lateral bud eventually ceases whereas the reoriented terminal bud resumes the original high growth rate. However, if the shoot is maintained in the inverted position for 7 or more days, then the growth rate of the highest lateral bud continues to increase even though the terminal bud is returned to the upright position. Experiments are planned to determine the presentation time.

- 9:45 EFFECTS OF COPIOTROPHIC AND OLIGOTROPHIC NUTRIENT CONCENTRATIONS ON TWO SPECIES OF MARINE FUNGI (CHYTRIDS). Paul Jones and James P. Amon, Department of Biological Sciences, Wright State University, Dayton, Ohio 45435.

Coastal marine chytrids were isolated from Chesapeake bay algae and sediments and have been propagated in the laboratory under continuous culture. Nutrient levels are adjusted to simulate the natural environment. In nature, glucose concentration varies between 1 to 100  $\mu M$  and glutamic acid has a range of 1 to 20  $\mu M$ . Comparison of cells grown in continuous culture is made to cells grown by traditional batch cultures having high levels of nutrients. Doubling time, in low nutrient chemostats, of greater than 150 h suggest completion of the life cycle in 500 h or more. Studies on the nitrogen requirement (glutamic acid) show uptake mechanisms adapted to both 1-100 and 5000  $\mu M$  ranges. When subjected to low glucose concentrations (0.5  $\mu M$ ), the life cycle in both batch and continuous culture is shortened. When subjected to constantly high concentrations of glucose (50 mM) in perfusion chamber, the life cycle increases from 48 h to 92 h as glucose considerably delays zoospore development. Morphological observation of nitrogen starved cells by phase contrast and electron microscopy, shows relatively smaller cell size and accumulation of storage material, presumably lipids and carbohydrates. When the cells are grown in batch culture, their response to varying glucose concentrations suggests that low glucose is needed to trigger sporulation. However, results in continuous culture suggest that a high glucose concentration may be acting as a modifier at the genetic level, thereby delaying maturation.

- 10:00 A COMPARISON OF RACES AND MATING TYPES OF BIPOLARIS MAYDIS WITH RELATION TO THE EFFECT OF XYLOSE ON SPORULATION, PH AND AMMONIUM LEVELS IN THE CULTURE MEDIUM.  
T. W. Bischoff and M. O. Garraway. Department of Plant Pathology, The Ohio State University, Columbus, OH 43210 and Ohio Agricultural Research and Development Center, Wooster, OH 44691.

Isolates of B. maydis race T, mating type a or A and B. maydis race O, mating type a or A were incubated at 28°C in the dark on a glucose (10 g/l)-L-asparagine (4 g/l) medium with or without a 2 g/l supplement of D (+) xylose. Sporulation was significantly higher after 6 days of incubation on the supplemented medium than on the non-supplemented medium except for mating type A



of race O. After 10 or 14 days of incubation under similar conditions the enhancement of sporulation in the presence of a xylose supplement was evident for all isolates. Ammonium was produced after 6 days of incubation in the culture medium and its level was comparable between races and mating types. But, with the supplement of xylose the ammonium level averaged 125  $\mu\text{moles NH}_4^+ / 20 \text{ ml medium}$  while on the non-supplemented medium it averaged 206  $\mu\text{moles NH}_4^+ / 20 \text{ ml medium}$ . Trends in pH were similar to those observed for residual ammonium. The pH rose from an initial level of 5.8 to 6.4 with the supplement of xylose and 6.8 on the non-supplemented medium. However, after 10 or 14 days of incubation residual ammonium and pH increased to comparable levels on both media. Moreover, at these times the level of residual ammonium averaged 350  $\mu\text{moles NH}_4^+ / 20 \text{ ml medium}$  for all isolates while the pH averaged 8.1 for all isolates. Hence, the production of ammonium from L-asparagine appears to be a common process of *B. maydis*. Also, it appears that the type of carbohydrate source in the medium may regulate this phenomenon.

10:15 THE INITIATION OF LATERAL ROOTS IN *MARSILEA QUADRIFOLIA* L. Bai-Ling L. Liu, Dept. of Botany, The Ohio State University, Columbus, OH 43210.

The lateral root of the water fern *Marsilea quadrifolia* L. originates from a single cell, the lateral root initial, which is found opposite the protoxylem in the endodermal layer of the adventitious root. In contrast to angiosperms, the lateral root initial is delimited within the meristematic region near the root tip. It is usually discernible in the sixth merophyte in the longitudinal profile established by the sequential division of the root apical cell. Following an unequal transverse division, the smaller, distal daughter cell continues to divide and add to the endodermis longitudinally. On the other hand, the larger, proximal daughter cell destined to become the lateral root initial greatly increases in volume before division. Three to six lateral root primordia are established in each merophyte, resulting in a series of developmental stages along the length of the adventitious root. While the neighboring pericycle cells and cortical cells of the adventitious root proliferate to keep pace with the increase in contour of the emerging lateral root primordium, they are not directly involved in lateral root formation.

10:30 DEVELOPMENT OF THE GAMETOPHYTES AND EMBRYOS OF *PLATYCERIUM* AND *PYRROSIA*. T. N. Crumbaker, 398 West Hendricks St., Camden, Ohio 45311

An investigation was made of the development of the gametophytes of *Platycerium bifurcatum*, *P. grande*, *P. ridleyi*, *P. stemaria*, *P. veitchii*, *Pyrrosia lingua*, *P. rupestris*, *P. tricuspis*, and *P. varia*. Close similarities were found between the two genera among spore types, spore germination, plate formation prior to the establishment of a meristem, position and formation of the meristem, and mature gametophytes. Morphological and anatomical studies on the development of the embryos were carried out on *P. bifurcatum*, *P. stemaria*, *P. lingua*, and *P. tricuspis*. Both genera displayed parallel stages of development, from the two-celled embryos to the larger ones with four recognizable organs.

Developmental and morphological features of the gametophytes from these two genera show an affinity with those of *Drymoglossum*. Therefore, Nayar's (1970) placement of these three genera into the Platycerioidae of the Polypodiaceae has the most merit.

10:45 A COMPARISON OF NEARCTIC AND PALEARCTIC POLLINATION SYSTEMS IN PEDICULARIS. Lazarus Walter Macior, Department of Biology, The University of Akron, Akron, Ohio 44325.

The strong dependence of *Pedicularis* upon bumblebee (*Bombus*) pollinators and putative floral coevolution with these insects in North America raises the question of possible similar relationships in other floristic provinces where the circumboreal plant genus is found but has not yet been studied.

A preliminary study of five *Pedicularis* species in the alpine zone of Japan suggests similarities and differences in pollination syndromes. Circumboreal *Pedicularis* species appear to have a common pollination syndrome involving different *Bombus* species in respective floristic provinces. *Pedicularis* species endemic to Japan or North America have similar pollination syndromes based upon common floral form and associated pollinator behavior. Rostrate corollas have short, nectarless tubes and are pollinated by vibratory action of pollen-foragers. Erostrate species have deeper, nectariferous tubes penetrated by long-tongued, nectar-foraging pollinators. Basic sugar components of nectars of all species are the same, but within a species differences in nectar composition between floristic provinces were detected. All fifteen Japanese species have floral forms corresponding generally to those in North America. Mainland Asiatic forms with extremely long corolla tubes or cristate galeas are not found in Japan or North America. The nature and degree of anthecological convergence of genetically unrelated floral mechanisms and divergence of disjunct vicariant populations is being investigated.

## B. PLANT SCIENCES

FIRST AFTERNOON SESSION, SATURDAY, APRIL 1983

LIFE SCIENCES BUILDING, ROOM 224

ROBERT D. WARMBRODT, PRESIDING

## 1:30 BUSINESS MEETING

- 1:45 ULTRASTRUCTURAL STUDIES ON GONIUM PECTORALE (VOLVOCALES, CHLOROPHYTA) WITH EMPHASIS ON THE FLAGELLAR APPARATUS OF VEGETATIVE CELLS. Brian T. Greuel and Gary L. Floyd. Department of Botany, Ohio State University, Columbus, 43210.

Individual cells of the 16-celled coenobium of Gonium pectorale are surrounded by a separate mucilaginous sheath rather than being embedded in a common matrix as described from light microscopic studies. The flagellar apparatus of the vegetative cells is very similar to that of the previously examined immature colonies of Astrephomene. Two non-overlapping functional basal bodies are arranged in a V-shaped configuration about 90° apart and are connected by a striated distal fiber and two striated proximal fibers. At the proximal end of each basal body is a uniformly-shaped mass of electron-dense material which extends to the opposite basal body. Two accessory basal bodies are present. The four microtubular rootlets are arranged in a cruciate fashion with an alternation between 3/1 and 2 members. Electron-dense material is associated with each rootlet. Fine striations occur in the material associated with the 2-membered rootlet. In fully matured cells, the basal bodies are slightly separated, a condition different from Chlamydomonas and similar to the early developmental stages of Astrephomene. The basal bodies of G. pectorale, however, do not become as widely separated as those found in mature Astrephomene cells. These ultrastructural features support the traditional placement of G. pectorale as an intermediate between the unicellular Chlamydomonas and the more complex colonial Volvocalean genera such as Astrephomene.

- 2:00 FLAGELLAR APPARATUS DEVELOPMENT IN THE COLONIAL GREEN ALGA PLATYDORINA CAUDATA (VOLVOCALES, CHLOROPHYTA). Mark G. Taylor and Gary L. Floyd. Department of Botany, Ohio State University, Columbus 43210.

In the biflagellate vegetative cells of Platydorina caudata, post-inversion flagellar apparatus reorganization accompanies the transition from a spherical, hollow immature colony to the flattened, horseshoe-shaped mature form. In all stages examined, accessory basal bodies are present, and 180° rotational symmetry is absent. In the spherical colonies, the flagellar apparatus possesses closely associated basal bodies in a V-shaped arrangement, striated distal and proximal fibers, and microtubular rootlets in a 4-2-4-2 pattern. The distal fiber is not centrally located as in most chlorophycean cells, but is lateral to the longitudinal plane that bisects the basal bodies. In more mature, flattened colonies, the basal bodies become widely separated, though still connected by the distal and proximal fibers. A striated, electron-dense fiber connects the 4-membered rootlets to each other; a second, similar fiber connects the 2-membered rootlets. The two fibers cross at a point midway between the two basal bodies and just proximal to the distal fiber. In fully mature, presumably premitotic colonies, the basal bodies become further separated, and are no longer connected by the distal fiber. The rootlet-associated fibers elongate and span the distance between the basal body/rootlet complexes, as does a fibrous component that connects the proximal regions of the basal bodies. The flagellar apparatus developmental events are very similar to those observed in Astrephomene, a colonial Volvocalean alga that does not undergo inversion.

- 2:15 STRUCTURE OF THE LEAF OF PYROSSIA LONGIFOLIA--AN EPIPHYTIC, POLYPODIACEOUS FERN EXHIBITING CRASSULACEAN ACID METABOLISM. Robert D. Warmbrodt, Department of Botany, The Ohio State University, 1735 Neil Avenue, Columbus, Ohio 43210.

The leaf of Pyrossia longifolia was examined by light and electron microscopy to determine various interrelationships and cytological characteristics of the ground and vascular tissue. The succulent leaf has a reticulate vascular system embedded in mesophyll tissue that is not differentiated into distinct palisade and spongy layers. The large, isodiametric mesophyll cells each contain a thin, parietal layer of cytoplasm surrounding a large, central vacuole. The chloroplast-microbody ratio in the mesophyll cells indicates Pyrossia may be a high photorespirer and, thus, similar in that sense to C<sub>3</sub> plants. Mesophyll tissue is separated from vascular tissue by a tightly-arranged layer of chlorenchyma cells and an endodermis with Casparian strips. The walls of both layers of cells lack suberin lamellae. The collateral veins contain vascular parenchyma cells, sieve elements and tracheids in addition to a

continuous layer of pericycle cells. The vascular parenchyma, each 2-3 times as large as the sieve elements, are characterized by dense cytoplasm and chloroplasts which contain a peripheral reticulum. Parenchymatic elements are connected by plasmodesmata which lack neck constrictions or sphincter-like structures. Connections between sieve elements and parenchymatic elements are pore-plasmodesmata with wall thickenings on the parenchymatic-element side. Based on relative frequencies of connections between various cell types, solutes may move from mesophyll to the site of phloem loading solely in the symplast or by a combination of symplast and apoplast.

2:30

A COMPARATIVE STUDY OF FLAVONOIDS IN CERATOPHYLLUM DEMERSUM L. AND C. ECHINATUM A. GRAY (CERATOPHYLLACEAE). Donald H. Les, Department of Botany, The Ohio State University, 1735 Neil Avenue, Columbus, OH. 43210.

Members of the aquatic genus Ceratophyllum are characterized by extreme reduction in both vegetative and reproductive organs resulting from adaptation to their hydric environment. This reduction has resulted in a paucity of useful taxonomic characters, hence taxonomic treatments often incorporate few characters to delimit taxa. Consequently, authors often disagree on the disposition of taxa with some treating different species as varieties of one species. Initially described as a species, C. echinatum was later reduced to a variety of C. demersum. Later evidence prompted the reinstatement of the taxon to species rank by most authors. The flavonoids of C. demersum and C. echinatum were studied to establish the chemical relationships between these taxa. C. demersum and C. echinatum were found to be very dissimilar in flavonoid components. C. echinatum possesses O-glycosylated flavones and flavonols whereas C. demersum possesses only flavones which are either O or C-glycosylated. Of the 7 flavonoids found in C. demersum and the 4 flavonoids found in C. echinatum, only one compound was common to both species. Carbon glycosides were most abundant in C. demersum while O-glycosides of chrysoeriol appeared in highest concentrations in C. echinatum. The dissimilarity of flavonoids of C. demersum and C. echinatum supports the recognition of these taxa as distinct species and indicates a wide chemical divergence of these superficially similar species.

3:00

FLAVONOIDS OF LIATRIS SERIES GRAMINIFOLIAE (COMPOSITAE; EUPATORIEAE). Ronald E. Pilatowski, The Ohio State University, Department of Botany, 1735 Neil Avenue, Columbus, OH 43210.

Liatris Schreber (Compositae; Eupatorieae) is a genus of perennial herbs of eastern North America. Series Graminifoliae consists of five species distributed from the Middle Atlantic States southward to Florida, Alabama, and Mississippi. Leaf flavonoids were examined from 165 populations of the members of the series. A variety of flavonoid structural types including flavones, flavonols, 6-substituted flavones, and C-glycosyl flavones were found in the series. However, two basic patterns emerge. Species occurring on the Atlantic and Gulf Coastal Plains (L. gracilis, L. graminifolia, and L. regimontis) possess 6-substituted flavones, while the remaining two species (L. helleri and L. turgida), which are Appalachian endemics, lack such compounds. The latter two species are characterized by flavone and flavonol glycosides. These results may suggest a close relationship between the two Appalachian endemics.

3:15

A SYSTEMATIC STUDY OF THE SCHIZACHYRIUM SCOPARIUM (POACEAE:ANDROPOGONEAE) GROUP IN NORTH AMERICA. Joe Bruner. Department of Botany, The Ohio State University. Columbus, Ohio 43210.

Interest in the evolutionary origin of S. scoparium (Little Bluestem) has prompted a systematic study of ten morphologically similar North American species of Schizachyrium. Up to the present time knowledge of morphological variation and biology of these species has been poorly understood. The first chromosome counts for S. maritimum, S. niveum, S. rhizomatum, S. sericatum and S. stoloniferum and confirmation of previous counts for S. gracile, S. littorale and S. scoparium indicate that the group is primarily tetraploid (2n=40). A new count of 2n=40 for S. condensatum (previous record 2n=20) is reported. Observation of growth form finds S. littorale and S. maritimum, previously characterized as being rhizomatous, to be caespitose. This suggests their closer relationship with S. scoparium rather than with the truly rhizomatous S. stoloniferum and S. rhizomatum. Numerical analyses demonstrate the discreteness of most of the species and suggest the close affinity of S. littorale, S. scoparium and S. stoloniferum.

3:30

FLAVONOID EVOLUTION IN ROBINSONIA (COMPOSITAE) OF THE JUAN FERNANDEZ ISLANDS. Patricia Pacheco, Daniel J. Crawford, Mario O. Silva, and Tod F. Stuessy. Department of Botany, Ohio State University, Columbus 43210, and Departamento de Botánica, Universidad de Concepción, Concepción, Chile.

The flora of the Juan Fernandez Islands contains many endemic genera. The endemic

Robinsonia of the Compositae with seven species is the second largest genus in the archipelago with six species on the largest and oldest island, Masatierra, and the seventh on the smaller, more remote, and younger island, Masafuera. The total flavonoid complement among all these species is 13 compounds, including the aglycone quercetin, and the glycosides based on apigenin and luteolin (flavones), isorhamnetin and quercetin (flavonols), eriodictyol and naringenin (flavanones), and taxifolin (dihydroflavonol). The distribution of these compounds among species of Robinsonia correlates with the previously established subgenera and sections. The most likely hypothesis for the evolution of flavonoids within the genus is that the ancestor had only flavonols. In sect. Eleutherolepis a gain of flavanones, dihydroflavonols, and flavones occurred. Within this section R. masafuerae, the only species of the genus on the geologically younger island, Masafuera, has apparently lost apigenin during its evolution within the last 1 million years.

3:45

THE POLLINATION ECOLOGY OF GENTIANA ANDREWSII AND G. CRINITA IN OHIO. Barbara H. Costelloe, Department of Biology, The University of Akron, Akron, Ohio 44325.

In a semi-wooded wetland in northeastern Ohio, Gentiana andrewsii was found to be protandrous, insect-pollinator dependent, and self-compatible when hand-pollinated. Comparable data for sympatric and synchronously blooming G. crinita were variable and inconclusive. Open-pollinated flowers of both species fruit abundantly. Cross-breeding tests showed limited cross-compatibility, but no putative hybrids between the two species were found. Foraging bumblebees (Bombus Latr. spp.) were the primary pollinators of both Gentiana species. Corolla tube depth of Gentiana species did not appear to discriminate between nectar-foraging pollinators on the basis of insect proboscis length. Differences in sugar components of Gentiana nectars did not appear to select particular Bombus pollinator species. Reflectance spectrophotometry and ultraviolet photography of corollas reveals similar spectra for both Gentiana species adapted to bumblebee visual spectra. Visual observations of pollinating insect behavior on Gentiana and species of other genera in the same plant community suggested that pollinator constancy was generally a function of plant species density and not one of innate or learned insect behavior.

It appears that reproductive isolation of Gentiana andrewsii and G. crinita is maintained by internal reproductive barriers and not by seasonal, mechanical, or behavioral external mechanisms.

4:00

DISTINGUISHING THE TWINING POLYGONUMS. Clinton H. Hobbs, Dept. of Biological Sciences, Kent State Univ., Kent, Ohio 44242

The classical method of separating these species is the presence and size of wings on the sepals enveloping the fruit. This has not proved to be very satisfactory. I have found a better method, namely, the nature of the surface of these sepals. The roughness or smoothness of the sepals is correlated with the roughness or smoothness of the enclosed achenes. Polygonum convolvulus L. exhibits rough, dull sepals enclosing the fruit and rough, dull achenes within, while Polygonum scandens L. exhibits smooth sepals and smooth, lustrous achenes. I will illustrate these differences with the preceding and other species by means of close-up pictures of herbarium specimens.

4:15

PHENETICS OF MELAMPODIUM (COMPOSITAE, HELIANTHEAE). Tod F. Stuessy and Jorge V. Crisci. Department of Botany, Ohio State University, Columbus 43210, and Museo de Ciencias Naturales, Universidad Nacional de La Plata, La Plata, Argentina.

Phenetic analyses of 37 species of Melampodium are presented using cluster analysis (UPGMA) and principal components analysis (PCA). Forty-two characters are employed, 22 of which are quantitative and 20 qualitative; 26 are from reproductive parts, 15 are of vegetative parts, and 1 is chromosome base number. Six analyses are presented, three UPGMA with all characters, reproductive characters, and vegetative characters, respectively, and three PCA with the same character sets. The UPGMA with all characters and the PCA with just reproductive characters gave the best resolution of taxonomic sections and series in correlation with the previous phyletic classification of the genus. The basic framework of classification of Melampodium is supported, but M. nayaritense shows closer affinity with series Melampodium than to series Sericea. Melampodium nutans, shown earlier by cladistic analysis to be problematical, does not relate well phenetically to any other species.

- 4:30 NUMERICAL TAXONOMIC STUDIES OF THE JUNCUS BIFLORUS ELL. -J. MARGINATUS ROSTK. COMPLEX (JUNCACEAE). Robert K. Jansen<sup>1</sup> and Neil A. Harriman<sup>2</sup>. Dept. of Botany, Ohio State Univ., Columbus, Ohio 43210. <sup>2</sup>Dept. of Biology, Univ. of Wisconsin-Oshkosh, Oshkosh, WI 54901.

The Juncus biflorus-J. marginatus complex comprises a morphologically variable species pair common throughout the eastern United States and occurring as far south as Argentina. Historically these two taxa have been treated as distinct species. A number of morphological features especially culm diameter, number of leaves per stem, number of veins and width of leaves, inflorescence height, number of glomerules per inflorescence, anther persistence, and characteristics of the seeds have been used to separate the two species. Overlap in these features, however, has caused difficulty in recognizing these taxa throughout their range of distribution. To aid in understanding the patterns of morphological variation and to resolve the taxonomic limits of these two taxa a detailed numerical taxonomic study of J. biflorus and J. marginatus was initiated. Fourteen characters were measured for 80 populations and these data were subjected to clustering, principal components, and discriminant analyses. The results support the merger of the two taxa into a single variable species.

- 4:45 ANATOMY OF THE PERICARP OF CLIBADIUM, DESMANTHODIUM AND ICHTHYOTHERE (COMPOSITAE) AND SYSTEMATIC IMPLICATIONS. Tod F. Stuessy and Ho-yih Liu. Department of Botany, Ohio State University, Columbus, Ohio 43210

The closely related genera, Clibadium, Desmanthodium, and Ichthyothere (Compositae, Heliantheae) are distributed in Mexico, Central America, and Northern and Central South America. Some of the species of Clibadium (e.g., C. laxum) have drupaceous achenes, which is unusual in the family. Comparative anatomical studies of the fruits of the three genera show a strong similarity in the arrangement of the epidermis, hypodermis, and phytomelan and fiber layers. In most regards, Desmanthodium and Ichthyothere are more similar to each other than either is to Clibadium. The method of deposition of the phytomelan in all three genera begins with a series of tubes and cones from the fiber layer followed by patchy deposition of dark resistant material that eventually solidifies into a continuous layer. The phytomelan layer probably functions to protect the developing embryo and may also serve in regulating timing of germination.

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## B. PLANT SCIENCES

SECOND AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 222

SARA P. STUBBLEFIELD, PRESIDING

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1:30 BUSINESS MEETING ROOM 224 LIFE SCIENCES BLDG.

- 1:45 A NEW CALAMITE FROM THE CARBONIFEROUS OF EASTERN KENTUCKY. Michael A. Cichan and Thomas N. Taylor. Department of Botany, The Ohio State University, 1735 Neil Avenue, Columbus, OH 43210.

A new species of Arthropityx is described from calcium carbonate nodules (coal balls) obtained from Pennsylvanian sediments of southeastern Kentucky. The axes are characterized by interfascicular rays that broaden toward the periphery of the wood and secondary tracheids with diameters that are more than twice as large as any yet reported in the genus. In addition, there is a well-developed rhytidome composed of several concentric periderm lamellae. An analysis of structural variability in the wood reveals that the secondary rays and ray cells increase in size centrifugally; such developmental data may prove to be useful in future taxonomic and phylogenetic treatments. The new species is compared to other late Paleozoic calamites and to Sphenophyllum, a Carboniferous sphenophyte liana. On the basis of the histological organization of the wood, the relatively small size of the axes, and the gross structural similarities with Sphenophyllum, it is suggested that the new species exhibited a scrambling growth habit.

- 2:00 SURFACE AND DECORTICATION FEATURES OF AN UPPER PENNSYLVANIAN WOODY LYCOPHYTE STEM. Kathleen Pigg. Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Split coal-ball specimens of an Upper Pennsylvanian woody lycophyte stem reveal the stem surface and several levels of decortication, allowing for correlation of surface features with internal anatomy. The stem surface is characterized in face view by vertically elongated strips of dark epidermal tissue, and relatively small and distantly-spaced leaf bases. At one decortication level, the cortex is composed of longitudinally oriented, homogeneous parenchyma tissue interrupted by prominent parichnos strands which accompany leaf traces. In some specimens, this tissue grades inward into an anastomosing network of cells. The specimens are comparable to several genera of lycophyte compressions, with the anastomosing surface most closely resembling the distinctive undulating cortical pattern of Asolanus Wood. Characterization of coal-ball surfaces for which anatomy is known and their correlation with problematical compression species increases our understanding of the biological significance of plants found in different preservational modes, and helps clarify the systematics of Paleozoic lycophytes.

- 2:15 CARBONIFEROUS SEED FERN POLLEN ULTRASTRUCTURE: ON THE GRAINS OF BOULAYA FERTILIS. Marie H. Kurmann and Thomas N. Taylor, Department of Botany, The Ohio State University, Columbus, OH 43210.

The genus Boulaya (Carpentier) was characterized in detail by Halle in 1933 for impression-compression specimens of pollen organs associated with the medullosan pteridosperms. Specimens are pyriform and consist of several fused sporangia that may extend up to 2.0 cm in length. Well preserved specimens possess "teeth" that probably correspond to the free ends of the pollen sacs. The specimens used in this study were borrowed from the British Museum (Natural History) and appear to consist of a variable number of sporangia, with 8 being the most probable number. Pollen grains are of the Monoletes type and range from 230-280  $\mu\text{m}$  in length. On the proximal surface is a monolete suture; distally the grains possess two longitudinal grooves. The sporoderm is two parted consisting of a homogeneous nexine with conspicuous lamellae, and an outer alveolate sexine up to 6  $\mu\text{m}$  in thickness. In this study the ultrastructure of the pollen is compared to other Monoletes-type grains extracted from pollen organs of the Halletheca and Aulacotheca morphological types.

- 2:30 PHLOEM ANATOMY IN THE PENNSYLVANIAN SEED FERN MEDULLOSA. Edith L. Smoot. Department of Botany, The Ohio State University, Columbus, OH 43210

Specimens of the seed fern Medullosa with well-preserved secondary phloem tissue have been discovered in coal balls ranging in age from early/middle to late Pennsylvanian. Material consists of stems with a variable number of vascular segments ("steles"). Phloem is preserved only in certain areas of the stem, but generally appears to be continuous with the vascular cambium region, and is located on both the internal and external sides of the vascular segments. The secondary phloem consists of alternating tangential bands of phloem fibers, sieve elements and axial parenchyma, separated by phloem rays. Phloem rays vary in height, but are generally extremely high, and average 5-6 cells in width. The rays are dilated toward the phloem periphery. Sieve elements are extremely long, thin-walled, and exhibit crowded sieve areas on their radial walls. The sieve areas are oval, approximately 8 x 28  $\mu\text{m}$  in size with numerous sieve pores, and some seem to show signs of callose deposition. The phloem anatomy of Medullosa appears quite similar to that previously described for the seed fern Callistophyton. Secondary phloem structure in these fossil seed plants is compared with that of living gymnosperms.

- 3:00 SPHENOPHYTE SPORE ULTRASTRUCTURE: A COMPARISON BETWEEN ELATERITES AND EQUISETUM. Marie H. Kurmann and Thomas N. Taylor, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

Elater-bearing spores, once thought to be relatively rare in Upper Carboniferous sediments, are now known to have been produced by many Pennsylvanian sphenophytes. Specimens of Elaterites triferens are radially symmetrical, trilete and possess three circinnately coiled elaters. The three elaters are attached to the distal surface by a triangular truss. At the ultrastructural level, the sporoderm of Elaterites consists of two principal layers; a uniformly thickened exospore, and a thicker, irregularly shaped perispore. The perispore is bilayered and organized in a series of ridges. The inner, granular layer is formed by expansion of the inner layer during development. The elaters consists of three distinct layers. A comparison of the spores of Elaterites and Equisetum reveals a number of morphological and ultrastructural differences. The exospore of Elaterites is thin and simple,

while in Equisetum it is thick and bilayered. In Elaterites the perispore is thick and organized in two layers, while in Equisetum this sporoderm component is simple and delicate. An ultrastructural comparison between Elaterites and Equisetum provides an opportunity to trace sporoderm evolution within these closely related taxa.

- 3:15 FERTILE SCHIZAEACEOUS FERN PINNULES HAVE NOT YET BEEN FOUND IN NORTH AMERICAN COAL BALLS. Charles W. Good. Department of Botany, Ohio State University, Lima Ohio, 45804.

A presumed fertile Schizaeaceous fern was described by Baxendale and Baxter (Univ. Kansas Sci. Bull. 51: 283-289 - 1977) from coal balls of Middle Pennsylvanian age. Attachment of sporangia to presumed pinnules is illustrated by these authors. Spores are described as monolete or alete with exine ornamentation composed of anastomosing ridges. New material from the West Mineral Kansas locality contains apparently identical material which closely resembles isolated sporangioophores of the sphenopsid cone genus Peltastrobus. Spores isolated from intact cones of Peltastrobus, although somewhat smaller than those described by Baxendale and Baxter, appear identical in both shape and exine ornamentation to the presumed Schizaeaceous spores described by these authors. Sporangium shape, sinuous outline of sporangium wall cells, and cell anatomy of the presumed Schizaeaceous pinnules further resemble isolated Peltastrobus sporangioophores. We conclude that specimens described by Baxendale and Baxter are sphenopsid and not Schizaeaceous.

- 3:30 STUDIES OF FOSSIL FUNGI II: ASCOMYCETOUS CLEISTOTHECIA FROM THE PENNSYLVANIAN OF NORTH AMERICA. Sara P. Stubblefield, Thomas N. Taylor, and Charles E. Miller. Department of Botany, The Ohio State University, Columbus, Ohio 43210 and Department of Botany, Ohio University, Athens, Ohio 45701.

Several genera of permineralized sporocarps including Sporocarpon, Dubiocarpon, Mycocarpon, Traquairia, and a previously unknown form are described from Pennsylvanian age coal balls. Each form is an ornamented, spherical body with a complex wall which encloses scattered asci and ascospores. Genera and species are distinguished primarily by differences in the structure of the cleistothecial wall. Although these organisms were originally regarded as extinct radiolarian-like protozoa, they are now often considered fungal, and probably represent ascomycetous fruiting structures. We have recently noted the similarity between Traquairia and members of the Eurotiales, particularly the Eurotiaceae. This family is characterized by closed, globose ascocarps with scattered, evanescent asci, features which are shared by the other fossil sporocarps. At the present time, the earliest known representatives of the Eurotiales come from Miocene sediments. However, the Ascomycetes may have appeared as early as the Silurian or Devonian, and other ascomycetous groups such as the Taphrinales and the Erysiphales probably arose by the Pennsylvanian. In light of the geological record of the Ascomycetes, the presence of the Eurotiales as early as the Pennsylvanian would not be surprising.

- 3:45 FACTORS EFFECTING THE GROWTH OF ATRIPLEX TRIANGULARIS IN AN OHIO SALT MARSH. S.H. Karimi and I.A. Ungar. Department of Botany, Ohio University, Athens, Ohio 45701.

Atriplex triangularis was found growing in an intermediate zone along a gradient of progressively increasing salinity and inundation at Rittman, Ohio. It is restricted to a zone between the less saline area containing a population of Hordeum jubatum and the more saline zone containing a population of Salicornia europaea.

Plants of A. triangularis were grown in the laboratory in a hydroponic solution at low and high light intensities with and without aeration, and at salinities ranging up to 3% NaCl. Data from these experiments indicate that optimal growth for this species occurs at high light intensities, in well aerated conditions and at moderate salinities. Shoot and root dry weights were reduced at high salinities. Shading caused a drop in leaf weight which was accompanied by an increase in leaf number and specific stem length. Lack of aeration produced plants with reduced dry weight, a larger number of leaves and higher shoot:root ratio. These results suggest that shading may restrict the growth of A. triangularis in the Hordeum zone and that high salinity and poor aeration are the primary factors limiting its growth in the Salicornia zone.

- 4:00 THE EFFECT OF SALINITY AND TEMPERATURE ON GERMINATION OF POLYMORPHIC SEEDS AND GROWTH OF ATRIPLEX TRIANGULARIS. Mohammad Ajmal Khan and Irwin A. Ungar. Department of Botany, Ohio University, Athens, Ohio 45701.

Polymorphic seeds of Atriplex triangularis were tested in various temperature and salinity regimes in order to determine their germinability and early seedling growth

under these conditions. Large seeds generally had a higher percent germination in saline medium than did the small seeds. The rate of germination and percentage of germination decreased with increased salinity stress. High day and low night temperatures enhanced germination of seeds in all size classes. Early seedling growth is promoted in large seeds at low salinities and high day and low night temperatures.

- 4:15 THE VEGETATIONAL RESPONSE OF A NEBRASKA SAND HILLS GRASSLAND TO A NATURALLY OCCURRING FALL BURN. Linda C. Noll, John D. DuBois, and Lawrence A. Kapustka, Botany Department, Miami University, Oxford, Ohio 45056.

During October, 1981, lightning ignited the heavy fuel load on an upland site of the Arapaho Prairie, Arthur County, Nebraska. Before local ranchers and rain doused the fire, approximately 1 ha burned. In June, 1982, we established a stratified grid system in the burned area and a selected adjacent unburned area considered to be an appropriate control. Twenty randomly selected 0.1 m<sup>2</sup> plots were clipped in each area 7-8 June, 7-8 July, 7-9 August, and 11 October, 1982. The aboveground plant parts were sorted to species, oven dried and phytomass determined to the nearest 10 mg. The fire did not appear to affect individual species or total phytomass. No species were extirpated as a result of fire, and we found no increases in phytomass due to the burn when compared to the control. The response will be compared to the fire response of Tall Grass Prairies.

- 4:30 FOREST STRUCTURE ON THE LAKE ERIE ISLANDS. Ralph E.J. Boerner. Department of Botany, Ohio State University, Columbus, Ohio 43210

The Lake Erie Islands archipelago includes 22 islands which are distinct from the neighboring Canadian and American shores in climate, topography, surficial geology, and soils. The forest communities of these islands were analyzed for species composition, relationships to environmental factors and similarity to mainland forests. Reciprocal averaging ordination split the forest stands into two tight clusters. Upland forests, dominated by *Acer saccharum* and *Celtis occidentalis*, were found where bedrock level exceeded lake level. Lowland forests occurred on sites where bedrock level was below mean lake level and were dominated by combinations of *Fraxinus pennsylvanica*, *Populus deltoides*, *Cornus drummondii* and *Acer saccharinum*. Within each major cluster, distribution and abundance of species was correlated with soil water availability. Analysis of 20-40 year old sites indicated multiple pathways for succession, with abandoned vineyards rapidly developing closed canopies similar to surrounding forests while pastures, orchards, and quarries developed distinctive vegetation types.

- 4:45 DINITROGEN FIXATION IN THE WET MEADOWS AND EMERGENT ZONES OF TWO NEBRASKA SAND HILLS LAKES. Lawrence A. Kapustka. Department of Botany, Miami University, Oxford, Ohio 45056.

N<sub>2</sub>(C<sub>2</sub>H<sub>2</sub>)ase activity was determined along a moisture gradient transect of neutral-slightly acid lake (Island Lake, pH 6.8) and an alkaline lake (Goose Lake, pH 7.8) in western Nebraska. Vegetation graded from *Carex* meadow to *Typha* to *Scirpus* along each of the 50 m transects. The *Carex* meadow exhibited relatively low and variable rates of N<sub>2</sub>(C<sub>2</sub>H<sub>2</sub>)ase activity, whereas the *Typha* and *Scirpus* zones had consistently high rates of activity. Comparisons of the two transects show higher rates of activity at the Goose Lake transect, presumably reflecting the favorable influence of alkaline pH on cyanobacteria. The rates of N<sub>2</sub>(C<sub>2</sub>H<sub>2</sub>)ase activity and the absolute amounts of each vegetation zone will be used to estimate the total N influx into these wetland areas.

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## C. GEOLOGY

FIRST MORNING SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 69

DOUGLAS E. PRIDE, PRESIDING

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- 8:30 AN INTRUSIVE CHRONOLOGY ON CAPE ANN, MASSACHUSETTS. John S. Roulston, Department of Geology, The College of Wooster, Wooster, Ohio 44691.

The Cape Ann area is composed of a complex assemblage of mafic and salic igneous rocks of probable lower Paleozoic age, collectively referred to as the Cape Ann Plutonic Series. Detailed field study on the northwestern portion of Cape Ann indicates that a chronology of intrusive activity can be established. Petrographic analysis is employed to examine dike petrogenesis and support their classification into three groups:

- 1) The earliest dike set exhibits textures and mineralogy which suggests they are the result of hybridism of mafic and granitic magmas.
- 2) The second dike set shows evidence of autometamorphism, as this set was emplaced prior to the complete consolidation of the host granite.
- 3) A third dike set intruded well after the consolidation of all rocks in the plutonic series.

Electron microprobe analysis on pyroxenes in the latter two dike sets show that the second set has a genetic relationship with the mildly alkaline Cape Ann Plutonic Series. The third set are tholeiitic in nature, which suggests they are related to basaltic igneous rocks of Mesozoic age.

- 8:45 PETROGRAPHIC ANALYSIS OF NGAWHA 18, NORTHLAND, NEW ZEALAND. Laura L. Eye, The College of Wooster, Wooster, Ohio 44691.

The Ngawha geothermal field, northern peninsula of New Zealand's North Island, is considered a potential solution to the energy dependence of that area. Although the extent of the field is not yet known, its energy potential is believed to be sufficient to power a 100 mw electrical generator by the year 1990. Studies are currently being made to determine more about the subsurface geology of the Ngawha region. Petrographic analyses of routinely collected drilling cores and cuttings aid in the construction of stratigraphic models of the area.

The petrography of Ngawha drillhole 18 has been analyzed by x-ray diffraction (XRD), differential thermal analysis, optical crystallography, and visual identification of hand specimens. The resulting information has been incorporated with the drilling completion report and proposed geological history of the area to create an accurate picture of the petrography of Ngawha 18.

Quantities of quartz, calcite, and pyrite are present throughout the drillhole. Samples to a depth of 350 m show large quantities of sheet silicates, particularly montmorillonite and interlayered illite-montmorillonite. Kaolinite and occasional biotite are also present in lesser quantities. Cross-veining and recrystallization suggest that the area has undergone several intervals of thermal activity.

- 9:00 THE ORIGIN OF METAL ALLOYS IN ALPINE-TYPE PERIDOTITES: THE JOSEPHINITE EXAMPLE. LEAVELL, Daniel N., Department of Geology & Geography, Denison University, Granville, Ohio 43023

Josephinite, a mineral assemblage of native metal alloys, oxides, silicates and sulfides, is found in serpentinized portions of the Josephine peridotite in southwestern Oregon. This assemblage occurs as both small in-situ grains and as placer nuggets along Josephine Creek. Several mechanisms have been suggested for the genesis of josephinite. These models differ in their consideration of the alloy assemblage as primary or secondary components of the peridotite. A secondary origin is preferred through syn-serpentinization formation under locally reducing conditions. Experimental studies modeling desulfurization of Fe-Ni-Cu sulfides in a serpentinizing environment have shown this to be a feasible model.

Detailed mapping of the Josephine Mountain area has shown the peridotite to be variably serpentinized. The distribution and abundance of metal alloys in the bedrock reflects this development of serpentine. The bedrock over which Josephine Creek flows is highly serpentinized and in-situ alloys are locally abundant. These in-situ metals have been compared with those in the placer josephinite and show a similar range in compositions and many textural similarities. One significant mineralogical difference is the abundance of andradite in many placer nuggets. This phase is considered to have formed after the Ni-Fe alloy by replacement. The similarities between nugget and in-situ josephinite suggest that both should be considered in genetic modeling of this unique assemblage.

- 9:15 IDENTIFICATION AND AGE OF NEOFORMED PALEOZOIC FELDSPAR (ADULARIA) IN A PRECAMBRIAN BASEMENT CORE FROM SCIOTO COUNTY, OHIO. Teresa M. Mensing and Gunter Faure, Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210

Fourteen core samples of Precambrian granitic gneisses from a well drilled in the Green Township, Scioto County, Ohio were studied to determine the origin of alkali feldspar in these rocks. The well intersected the basement at a depth of 1700 meters and pene-

trated 11.3 meters of Precambrian crystalline rocks. Petrographically the samples in the upper 6.4 meters of the basement core show evidence of alteration by the presence of hematite, limonite and chlorite and by the absence of plagioclase. Alkali feldspars from this part of the core are turbid, have a low 2V of about  $10^\circ$ , are highly enriched in K, have low Na and Rb concentrations, lack cathodoluminescence, and define a Rb-Sr isochron yielding a date of  $599 \pm 69$  Ma. Core samples from below 6.4 meters appear fresh and unaltered. Alkali feldspar from this portion of the core is orthoclase, shows uniform blue luminescence and gives a Rb-Sr isochron date of  $1162 \pm 11$  Ma. These results indicate that feldspars in the lowest part of the core are primary minerals that crystallized during the Grenville Orogeny, whereas the K-feldspar in the top of the core is of low-temperature secondary origin. The formation of this feldspar is explained as a consequence of chemical weathering of primary feldspar during late Precambrian time to clay minerals that were later reconstituted as low-temperature K-feldspar (adularia) by reactions with brines derived from the overlying Mt. Simon Formation of Cambrian age.

- 9:30 A PUZZLING OCCURRENCE OF CALCITE IN ORIENTED BUT NON-PARALLEL OVERGROWTH ON CALCITE: OR, THE RETURN OF THE SKATING CRYSTAL. R. Peter Richards, 188 N. Oberlin Road #O, Oberlin, Ohio 44074.

Calcite crystals found in oily vugs in a limestone quarry at Rocky Ridge, Ohio have attached to them many small crystals of the same morphology. The large crystals have an inner core of form (0111) which is often separated from the outer portion by a layer of asphalt. The outer surface is of a form approximate to (0221) but strongly curved toward a more scalenohedral shape equatorially. The small crystals are associated with this outer shell only. The small crystals are related to the host by a rotation of about  $50^\circ$  about the line [1120]. The orientation is not consistent with any of the common twin laws of calcite. The orientations of small individuals vary from each other by as much as five degrees in rho and phi as measured on a two-circle goniometer. These observations suggest that the satellite crystals originated as tiny nuclei which settled onto the surface of the host and assumed a preferred orientation through interaction of the electrostatic fields of the two crystals.

- 9:45 ORIGIN OF THE EARTH-MOON SYSTEM: A REVIEW OF HYPOTHESES AND EVALUATION OF SUPPORTING GEOLOGICAL EVIDENCE. Robert J. Malcuit, Department of Geology and Geography, Denison University, Granville, Ohio 43023

The origin of the Earth's Moon remains an unsolved problem. There are three main categories of hypotheses: fission, co-formation, and capture. The purpose of this paper is to summarize the principal features, briefly analyze the physical feasibility, and discuss the geological testability of models in each of the categories. Three types of fission models have been proposed: (1) that a body of lunar size and mass separated from the Earth early in Earth history; (2) that an equatorial cloud of silica-rich vapor was fissioned off the primitive Earth and eventually condensed and accreted to form the Moon; and (3) that the Moon was an intermediate product of fission between Earth and Mars. The two general types of co-formation models are: (1) that the Moon formed in geocentric orbit simultaneously with Earth and (2) that the Moon was formed from a group of natural satellites of Earth. The major classes of capture models are: (1) that the Moon was formed in a heliocentric orbit which was similar to Earth's orbit and was subsequently captured by Earth; (2) that the Moon formed inside the orbit of Mercury and was subsequently transferred to the vicinity of Earth's orbit and then captured by Earth; and (3) that the Moon was formed in an orbit located between that of Mars and the Asteroid Belt and was subsequently perturbed by Jupiter into an Earth-crossing orbit and was later captured by Earth. Geochemically testable predictions can be made for each of the three major categories of hypotheses for lunar origin. In addition, testable models for the distribution and structure of circular maria have been proposed for a gravitational capture model.

- 10:00 NITRATE CONTAMINATION IN A SHALLOW, UNCONFINED AQUIFER IN PERRY, OHIO. W.R. Kelly, and G. Matisoff, Dept. of Geosciences, CWRU, Cleveland, OH 44106; and J.M. Inglis, Chevron U.S.A., 935 Gravier St., New Orleans, LA 70112

The groundwater system in northern Perry Township in Lake County, Ohio, was examined for its hydrologic and chemical properties to determine the extent of nitrate contamination, its source and transport characteristics. Nitrate concentrations were elevated throughout the 1.5 square mile area, and in one well, the concentrations exceeded the United States Environmental Protection Agency's limit. Within the study area, fertilizer nitrogen and septic tank effluent are the probable sources of nitrate contamination in groundwater. A septic effluent component may be indicated in two wells by the molar ratios of total nitrogen to total phosphorous. The contamination in the western part of the study area is due to the soil's inability to remove the large quantities of nitrogen supplied by a commercial nursery prior to infiltration into the groundwater.

Two computer models were used to simulate steady-state groundwater flow and solute transport in the study area. The flow model accurately depicted the character of the water table. The solute transport model was used to simulate the areas of contamination and to observe the resulting contamination movement. This model is able to predict the down-gradient effects of up-gradient contamination.

- 10:15 THE SOURCES OF STRONTIUM IN SOIL SALTS ON MOUNT EREBUS AND ON ROSS ISLAND, ANTARCTICA  
Karen S. Taylor, Department of Geology, Kent State University, Kent, Ohio 44242,  
Gunter Faure and Charles E. Corbato, Department of Geology and Mineralogy, The Ohio  
State University, Columbus, Ohio 43210 and Lois M. Jones, Research and Development  
Department, CONOCO, Inc. Ponca City, Oklahoma, 74603.

Salt deposits in the form of crusts and efflorescences are a common feature of rock exposures along the coast of Ross Island and on the summit of Mt. Erebus, an active volcano that dominates the island. The  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios of salts from coastal sites decrease with increasing elevation from 0.70861 at Cape Royds to 0.70344 at the top of Castle Rock on Hut Point Peninsula, only 413 meters above sea level, but may also vary along the coast in response to the seasonal duration of open water. The variation of  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios can be attributed to mixing of marine Sr with Sr derived from the volcanic rocks and confirms the importance of chemical weathering as a source of Sr in these secondary salts. Yellow salts of complex mineralogical composition from the summit of Mt. Erebus have  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios whose average is 0.70345. This value is consistent with the hypothesis that these salts formed both from the plume of volcanic gases emanating from a convecting lava lake of phonolitic composition and by chemical weathering of the volcanic rocks. One sample of white salt from ice caves at the summit has an anomalously high  $^{87}\text{Sr}/^{86}\text{Sr}$  ratio of 0.70460 perhaps because it contains a component of marine Sr released by melting of large quantities of snow in the ice caves.

- 10:30 EXCEPTIONALLY HIGH STRONTIUM CONCENTRATIONS IN SHELLS OF FRESHWATER CLAMS FROM THE  
WESTERN PART OF THE SCIOTO RIVER DRAINAGE BASIN IN CENTRAL OHIO. Jack Kovach,  
Geology Dept., Muskingum College, New Concord, Ohio 43762

The concentration of Sr in the shells of 60 freshwater clams among 3 species from 17 localities in the eastern U.S. have been determined by atomic absorption spectrophotometry. Sr concentrations ranged from 190 ppm in a specimen of Amblema plicata from the Illinois River to 6740 ppm in a specimen of Elliptio dilatatus from Big Darby Creek in central Ohio.

Shells from streams in the western part of the Scioto River drainage basin in central Ohio are characterized by exceptionally high Sr concentrations ranging from 4600-6740 ppm in 6 specimens of E. dilatatus from Big Darby Creek in Pickaway County and from 4830-5500 ppm in 3 specimens of Anodonta grandis from the same stream in Franklin County. One specimen of Amblema plicata from Little Darby Creek in Madison County was analyzed and contained 4340 ppm of Sr.

In contrast, 50 specimens of these 3 species from 14 other localities in Ohio, Kentucky, West Virginia, Michigan, Illinois, Iowa, Tennessee and New York yielded Sr concentrations ranging from 190 to 795 ppm.

These results are in accord with those of previous investigators who have reported anomalously high Sr/Ca ratios in surface and ground waters in parts of central and western Ohio, due apparently to the presence of celestite in the glacial tills and/or bedrock of those areas.

- 10:45 COAL GEOLOGY AND THE CARBON AND OXYGEN ISOTOPIC COMPOSITION OF  $\text{CaCO}_3$  IN COAL  
BEARING PENNSYLVANIAN SEDIMENTS FROM WELL NO. 23 BRISTOL, RHODE ISLAND.  
Darioush T. Ghahremani, Department of Geological Sciences, Case Western  
Reserve University, Cleveland, Ohio 44106

Narragansett basin is a complex structural depression containing folded and faulted rocks of Pennsylvanian age. The coal beds are best known near the basin margins, where they are tilted up to the surface. Samples of sedimentary rocks taken were subjected to petrographic and isotopic studies in order to determine a) rank, quality and metamorphic history of the coal, b) the environment of deposition, and c) metamorphic effects on the isotopic composition of calcite. Petrographic results revealed that Narragansett coal consists of massive vitrinite, semi-fusinite and micrinite. The mineral matter is finely dispersed. The mean maximum reflectance of 4.8525% indicates that this coal could only be used for heating or gasification purposes. Isotopic results suggest that the calcite (as matrix) during the Pennsylvanian time in Rhode Island and Massachusetts may have originated from secondary precipitation at higher temperature, or, if it was precipitated in sedimentary basins, it must have undergone higher temperature alteration. If this is true, then the calcite from well No. 23 cannot be used as an indicator of paleoclimate or paleolatitude. As regards the isotopic composition of calcite as vein filling, the mean  $\delta^{18}\text{O} = -3.095$  indicates that the epigenetic calcite was deposited by cold meteoric water.

## C. GEOLOGY

SECOND MORNING SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 70

JANE L. FORSYTH, PRESIDING

- 8:30 THE POSSIBLE DISCOVERY OF A FOSSIL ISLAND OF LOWER LAKE WARREN. H. Gordon Bailey, III. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

By using U.S.D.A. aerial photographs, 99 sand blowouts were located in a 30 square mile area known as the Oak Openings of Lucas, Henry and Fulton counties. These blowouts are disturbances that were originally caused by farming and quarrying in the area within historical times. The disturbances were then further excavated and modified by wind erosion into open sand depressions. Almost all of these depressions are found to be 675 feet above sea level on raised Oakville soil ridges that run along the border of what seems to be a fossil island of lower Lake Warren. The idea that these ridges are barrier dunes is substantiated by their non-random geographic pattern. In addition, a local sand quarry affords a 25 foot deep cross section of the island sand. Here, sand above 675 feet lies in high angle dune-like crossbedding while sand below this level make up horizontal or gently sloping beach-like deposits. Finally, sand samples taken from these two areas, when sifted at quarter phi intervals clustered into two distinct groups that are thought to be a dune/beach separation.

- 8:45 THE COLUMBUS CUESTA IN NORTH-CENTRAL OHIO.  
Jane L. Forsyth, Department of Geology, Bowling Green State University, Bowling Green, Ohio 43403

The cuesta on the Devonian Columbus Limestone forms an observable topographic feature only in north-central Ohio, but even there is minor compared to the impressive Appalachian (Portage) Escarpment on the Mississippian sandstone cuesta farther east. However, the Columbus cuesta south of Castalia rises impressively above the surrounding lake plain, and is associated with several famous Ohio geologic features: the Blue Holes of Castalia, the giant quarry on Marblehead peninsula, and the glacial grooves on Kelleys Island. In addition, the Columbus Limestone itself is unique in being remarkably pure (90%  $\text{CaCO}_3$ ), resulting in an impressive line-up of large quarries across the state (at Columbus, Marion, Flat Rock, Sandusky, Marblehead, and Kelleys Island), and in the occurrence of all of Ohio's commercial solution caves (Ohio, Zane, and Olentangy Caverns). Contrary to other Ohio topographic features, the Columbus cuesta is more striking to the north, despite the glacial deposits there, than in the south, probably mainly because the unit thins southward as a result of the southerly transgression of the Columbus sea. Thus, the most impressive cuesta topography occurs north of Bellevue and south of Castalia, creating a band of some of the best karst topography in Ohio. It is into this area that the 1982 OAS geology field trip will go.

- 9:00 PETROGRAPHY, DEPOSITIONAL ENVIRONMENTS AND PALEOTECTONICS OF THE LOWER BIRD SPRING FORMATION (MORROWAN-ATOKAN), CLARK COUNTY, NEVADA. Kozar, Michael G. & Wilson, Mark A. Department of Geology, The College of Wooster, Wooster, Ohio 44691.

The depositional history of the lower Pennsylvanian portion of the Bird Spring Formation in the southwestern United States is characteristic of tectonic activity as well as epeiric deposition. Pennsylvanian strata in north-central Nevada reflect the broad, north-trending Antler Orogenic Highlands. This belt, which acted as a positive barrier between an eastern foreland basin containing clastic and carbonate rocks and a western assemblage of deep-water shale and chert, was apparently submerged in what is now extreme southern Nevada. Sediments deposited in the eastern foreland basin during Morrowan-Atokan time are represented by the mostly bioclastic and argillaceous limestones of the Bird Spring Formation in the Spring Mountains west of Las Vegas. From petrographic examination of rocks collected at three localities in the Spring Mountains, five depositional facies are recognized: (1) subtidal; (2) above wave base, restricted shallow marine; (3) agitated carbonate shoal; (4) shallow, neritic open circulation; and (5) quiet, neritic open circulation. Because of the abundant and relatively continuous carbonate deposition, and the relative absence of siliciclastic sedimentation, it is postulated that the Antler Orogenic Belt was relatively tectonically inactive in southern Nevada during Morrowan-Atokan time.

- 9:15 THE GEOLOGY OF THE PINE QUADRANGLE, CENTRAL ARIZONA  
 Melanie Weisman 2512 N. East St. Flagstaff, Arizona 86001  
 Anne Scales Box 2655 College of Wooster, Wooster, Ohio 44691

The 7.5-minute Pine quadrangle in central Arizona was mapped during 1981 and 1982; rock units were identified, described, and correlated with similar rock units of surrounding areas for the United States Geological Survey.

The Pine quadrangle is bisected by the Mogollon Rim. Trending in an east-west direction through the Pine quadrangle, the two-hundred mile south-southwest facing escarpment trends southeast from north of Jerome, Arizona, to the White Mountains in east-central Arizona where it is covered by volcanic rocks. The Mogollon Rim constitutes the northern boundary of the Transition Zone or Mountain Region which separates the Colorado Plateaus and Basin and Range structural and physiographic provinces. The origin of the Mogollon Rim is basically structural; the escarpment contains high angle normal faults in some areas and aligned basins that abut it in other areas. Nearly horizontal upper Paleozoic strata dip slightly north-northeast in a homocline. The best exposures of strata are in canyons cut by streams along the escarpment.

The implications of the development and subsequent retreat of the Mogollon Rim in the Pine quadrangle and surrounding areas are discussed.

- 9:30 DETECTION OF GAS SEEPS IN NORTHEAST OHIO: POTENTIAL STRATEGY FOR DEVELOPING DEVONIAN SHALE GAS. Philip O. Banks and Darioush T. Ghahremani, Department of Geological Sciences, Case Western Reserve University, Cleveland, Ohio 44106

Natural gas associated with Devonian shale underlies much of eastern Ohio, but shale gas wells tend to be economically unattractive because of low permeability and formation pressures. These disadvantages can be minimized by searching for sites where natural fractures have created fracture permeability in the shales. Numerous steeply dipping joints are known to cut Ohio's bedrock. Such joints permit subsurface gases to leak to the surface, and one can postulate that greater leakage should occur where subsurface fracture intensity is greater. We have used inexpensive radon detection methods to search for gas leakage in two pilot plots in Cuyahoga County. This approach is based on the knowledge that the shales produce not only hydrocarbon gases but also radon gas due to the decay of uranium in organic-rich horizons. The results show that gas leakage does occur and is correlated with fracture patterns as revealed by topographic lineaments. At one site we also analyzed the soil gases for hydrocarbons and found higher levels associated with higher radon activity. Thus radon surveys may be a simple and powerful method of locating favorable prospects for exploiting shale gas.

- 9:45 SUBBOTTOM SEDIMENTS FROM THE SOUTHWESTERN PART OF THE CENTRAL BASIN, LAKE ERIE.  
 Jonathan Fuller, Ohio Geological Survey, P.O. Box 650, Sandusky, Ohio 44870.

Sediments from a 250-square-mile area of the central basin were sampled with a vibratory corer which took cores up to 10 feet long. Core locations outline part of the Sandusky sub-basin and have water depths ranging from 32.8 to 55.6 feet below low water datum. Recovered sediments are grouped into 4 types (fluid brown mud, soft gray clay, sand, and fine-grain glacial material) which make up two different sediment sequences. One sequence, sand over glacial material, occurs almost exclusively on the Pelee-Lorain moraine. The other, fluid mud over soft clay over glacial material, is found throughout the deeper parts of the study area and typically includes a zone of shelly-sandy mud between the fluid mud and soft clay. The sediment types and their interpreted depositional environments include the sand which was deposited as a beach sediment on the moraine, the soft clay which was deposited in a quiet shallow-water lake, and the fluid mud which was deposited in a deeper lake environment. The beach was built on the moraine during a lower lake level prior to 4000 YBP. At the same time soft clay was accumulating in the small protected lake west of the moraine. A rapid 26-foot rise in lake level, about 4000 years ago, submerged the moraine and rapidly changed the area to a deeper water environment. The shelly-sandy mud records this rapid transition from the soft-clay-dominated shallow water to the fluid-mud-dominated deeper water environment which is present today.

- 10:00 SOURCES OF LAKE ERIE SEDIMENT BASED UPON GRAIN SURFACE FEATURES.  
 Robert Anderhalt, Department of Geology, Bowling Green State University, Bowling Green, Ohio 43403

Beach and nearshore sediment samples from the western and southern shore of Lake Erie were examined with a Scanning Electron Microscope (SEM) for grain surface features. The purpose of this analysis was to determine if the source of sand-size sediment was entirely from glacial deposits or if some sand may have been derived from local

sandstone units.

The majority of the grains examined by SEM were angular, with conchoidal fractures and some chattermarks, indicating a glacial derivation. However, a significant number of grains were observed which show well-developed quartz overgrowths. The overgrowths were acquired as a cementing phase during sandstone diagenesis and would have been removed by any subsequent glacial transport. The sources for these sandstone-derived grains were probably the Sylvania Sandstone in the western area and the Berea Sandstone along the southern shore.

- 10:15 MONITORING THE EFFECTIVENESS OF RECLAIMING ABANDONED STRIP-MINED LAND, MEIGS COUNTY, OHIO. John L. Lamb and Garry D. McKenzie, Department of Geology and Mineralogy, The Ohio State University, Columbus, Ohio 43210.

Sandy spoilbank material that eroded from abandoned strip-mines in southeast Ohio has contributed to sediment pollution in channels and floodplains since the early 1960's. Two reclaimed, formerly abandoned strip-mine sites, one unreclaimed site, and one unmined control site, have been observed since 1978 in order to determine changes in erosion rates and stream morphology. Several data collection techniques are used including sedimentation-pond sounding, spoilbank erosion-pin profiles, stream-channel transverse profiles, and a photographic record. Pond sounding showed that average basinal erosion was reduced from 4,000 to  $55 \text{ t} \cdot \text{km}^{-2} \cdot \text{a}^{-1}$ . Reclaimed spoilbanks exhibit lush vegetation and soilbuilding, except for isolated areas of slumping, rilling, or revegetation failure. The formerly sand-choked stream channels are downcutting following reclamation, up to  $15 \text{ cm} \cdot \text{a}^{-1}$  on one profile. Reclamation has been successful in reducing spoilbank erosion, stream flashiness, and channel infilling. Increased vegetation has reduced surface runoff. Sedimentation ponds and vegetative filtering have reduced sediment delivery offsite.

- 10:30 A CASE OF MINE SUBSIDENCE IN MINERAL RIDGE, TRUMBULL COUNTY, OHIO. Ann G. Harris, Department of Geology, Youngstown State University, Youngstown, Ohio 44555

On July 4, 1982 the back porch of Marvin and Ella McBride of Mineral Ridge, Ohio fell off indicating the suspected abandoned deep coal mine beneath their house was subsiding. Subsequent test drilling and the placement of a special television camera down the drill holes showed that a mine was beneath the house and there was only 9.5 to 12 feet of cover material above the roof of the mine to the surface. Structural damage occurred to the house as all four corners of the home sank, but the center of the house did not. The McBride site was stabilized by the Office of Surface Mining on an emergency basis. Various engineering problems developed such as the initial specified concrete mix did not flow properly and plugged up the drill holes, drill holes close to each other were not connected, part of the mine had open tunnels and part was caved in, problem in obtaining a drilling rig which could angle drill and discovery that the concrete was not migrating beneath the house as planned. A total of 87 holes were drilled and over 600 yards of concrete was placed in the ground to stabilize an area of a 50 foot radius from the center of the house. Funding is being sought to repair the estimated \$30,000 worth of damages done to the house by the subsidence in as much as it is not covered by any insurance, local, state or federal funding.

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## C. GEOLOGY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 70

FRED W. CROPP, PRESIDING

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## 1:30 BUSINESS MEETING

- 1:45 A MASTODON FROM LAKE SILTS IN ATHENS COUNTY, OHIO, AND THE PROBABLE AGE OF THE HIGH-WISCONSINAN (LANCASTER) TERRACE SYSTEM IN THE HOCKING VALLEY. Michael C. Hansen, ODNR, Division of Geological Survey, Fountain Square, Columbus, OH 43224 and Myron T. Sturgeon, Department of Geological Sciences, Ohio University, Athens, OH 45701.

In the spring of 1975 a well-preserved tusk and atlas vertebra of an American mastodon, Mammut

americanum, were discovered in a deposit of lake silt in the valley of Scott Creek, a small tributary of the Hocking River in Canaan Tp., Athens County, Ohio, approximately 60 km south-east of the maximum Wisconsinan ice advance in this region. The deposit is a fining-upward, olive-gray, clay-rich silt that has no apparent laminations, nor does it contain remains of invertebrates; however, rare fragments of wood are present.

A radiocarbon date on Tsuga from the upper 10 cm of the deposit yielded an age of 13,320±155 B.P. The silts at this site appear to be related to those at the junction of Scott Creek and Willow Creek described by Kempton and Goldthwait (1959). These authors suggested that these lake silts are related in origin to the high-Wisconsinan (Lancaster) terrace system in the Hocking Valley. This terrace system has previously been considered to be of Early Wisconsinan age. Our radiocarbon date, the first from lake silts in the Hocking Valley, suggests that these silts and the Lancaster terrace system are of Late Wisconsinan age.

2:00 INDICATIONS OF TEMPERATE DECIDUOUS FOREST VEGETATION IN ASSOCIATION WITH MASTODON REMAINS FROM ATHENS COUNTY, OHIO. Ralph E. Taggart and Aureal T. Cross, Department of Botany and Plant Pathology and Department of Geology, Michigan State University, East Lansing, MI 48824.

Post-glacial silt deposits in the Willow Creek drainage in Athens County, southeastern Ohio, containing skeletal remains of an American Mastodon, are currently undergoing palynological study. Hemlock wood associated with the skeletal material has been radiocarbon dated at 13,000 YBP. Preliminary pollen analytical data are available for silt samples from the tusk and wood horizons. These data suggest a deciduous forest source vegetation at the time of mastodon burial. Pollen of spruce and fir, common boreal indicators in pollen profiles until 11,000 YBP in glaciated areas of Ohio, are minor constituents of the silt pollen flora. These data are not in accord with current postulations regarding post-glacial vegetation dynamics and suggest relative stability of deciduous forest communities in some areas of southeastern Ohio south of the Wisconsin glacial advance. The Willow Creek deposits also serve to expand our conception of mastodon paleoecology as remains of these animals from glaciated areas are uniformly associated with cliseral conifer forests of boreal aspect.

2:15 STATISTICAL ANALYSIS OF PALEOCOMMUNITIES FROM THE LOGAN FORMATION (LOWER MISSISSIPPIAN) IN WAYNE COUNTY, OHIO. Leach, Bradford R. & Wilson, Mark A. Department of Geology, The College of Wooster, Wooster, Ohio 44691.

The sandstones, siltstones and shales of the Logan Formation of northeastern Ohio contain discrete horizons rich in marine invertebrate fossils. Previous workers have determined the paleoenvironment of the Logan Formation to have been a prograding deltaic sequence (see Bork & Malcuit, 1979). A detailed study of Logan fossil assemblages from outcrops east of Wooster, Wayne County, Ohio, has revealed three distinct paleocommunities: the Syringothyris Association is characterized by spiriferid brachiopods; the Aviculopecten Association is dominated by bivalves, as is the Grammysia Association. Statistical analysis supports the hypothesis that the assemblages represent life communities preserved after a short interval of post-mortem transport. The compositions of the paleocommunities show little intergradation and may therefore represent brackish, restricted and open marine depositional conditions.

2:30 EARLY SILURIAN CRINOIDS FROM OHIO. William I. Ausich, Department of Geological Sciences, Wright State University, Dayton, Ohio 45435

A marked transition occurred in echinoderm communities through the Early Silurian. During the Ordovician, benthic communities were commonly composed of representatives of many stalked echinoderm classes; whereas after the Ordovician, crinoids commonly dominated. Until recently no significant Early Silurian faunas were known to record this succession of echinoderm communities.

A newly discovered stalked echinoderm fauna from the Brassfield Formation of southwestern Ohio may provide important data to fill this Early Silurian evolutionary gap. In Ohio the Brassfield is either early or middle Llandoveryan in age. The new fauna contains cystoids and crinoids and has a specific diversity of approximately 30. Many elements of this fauna represent new genera and new species.

Taxonomic evaluation of this fauna has commonly required a re-evaluation of the taxonomy and phylogeny of each family studied. For example, study of Brassfield crinoids belonging to the family Calceocrinidae has required temporal re arrangement of existing genera, has yielded two new genera, and has resulted in a much more clear picture of phylogenetic relationships within this family. Where no Early Silurian Rhodocrinitacea were known previously, five Brassfield genera are now recognized.

The Early Silurian Brassfield echinoderm fauna from southwestern Ohio will greatly aid in a more thorough understanding of the Ordovician to Silurian transition in stalked echinoderm faunas.

2:45

## NEARSHORE FORAMINIFERAL ASSEMBLAGES FROM BERMUDA

Don C. Steinker and Kevin V. Clem. Department of Geology, Bowling Green State University, Bowling Green, Ohio 43403.

Few reports have been published on the benthonic foraminifera of Bermuda. This fauna is zoogeographically interesting because Bermuda marks the northernmost limit of the West Indian Province. Although the foraminiferal fauna of Bermuda is closely related to that of south Florida and the Bahamas, it is somewhat less diverse. This is partially attributed to the somewhat lower winter water temperature that precludes some warm-water species from Bermuda waters. Samples were collected from a variety of substrates in shallow nearshore waters around Bermuda, yielding a total of 86 foraminiferan species. Whereas mostly dead specimens were found among the bottom sediments, numerous live individuals were recovered from marine grasses and algae, especially calcareous codiaceans. In current-sheltered and wave-sheltered areas, the thanatocoenosis among the sediments is closely similar to the biocoenosis on the plants of the same area. In more dynamic environments, the smaller tests are removed by water movement and the more fragile tests undergo mechanical destruction prior to burial; therefore, the bottom sediment assemblage is dominated by larger, more robust and often abraded tests. As a result, the assemblage preserved among the sediments may accurately reflect the dynamics of the original depositional environment, but in more dynamic environments the record of the original community becomes obscured, thus hindering paleoecologic analyses.

3:00

ECOLOGY OF LIVING OSTRACODA FROM SELECTED LAKES AND POST-  
PLEISTOCENE HISTORY OF RECKLEY HILL POND, SAN SALVADOR ISLAND,  
BAHAMAS. Charles P. Luginbill, Geology Dept., University of  
Akron, Akron, Ohio 44325

Nine species of shallow water Ostracoda are recorded from top centimeter sediment and phytal substrates from four lakes on San Salvador Island, Bahamas. Salinities of the four lakes ranged from fresh to hypersaline. The ecological data obtained for the living Ostracoda confirms previous studies. Lakes on San Salvador provide the first live occurrence of Cyprideis ovata, which is apparently euryhaline.

Seven ostracode species were recovered from a 1.28 meter core taken through unconsolidated post-Pleistocene sediment of Reckley Hill Pond. The distribution of these species reflects three assemblages. The oldest assemblage is dominated by C. ovata and Perissocytheridea bicelliforma suggesting a brackish environment. The overlying assemblage is dominated by Hemicyprideis setipunctata and Aurila floridana suggesting salinities approaching normal marine. The youngest assemblage is dominated by C. ovata and Dolerocypria inopinata suggesting hypersaline conditions which may prevail currently throughout the year.

3:15 BREAK

3:30

## THE POLLEN CONTENT OF SOME OHIO CANNEL COALS.

Steve A. Hulett and James E. Bradley, Newark Campus  
The Ohio State University  
University Drive  
Newark, Ohio 43055

Samples were collected from five Ohio locations where cannel coals have been identified. The samples were prepared for study using the Shultz maceration method. The macerated residues were sieved through a 210 micron screen to separate the megafraction from the microfraction. The plus 210 micron fraction was examined using a binocular dissecting microscope, and the less than 210 micron fraction was examined using a transmitting light microscope. Both the megafraction and the microfraction of all samples were found to be almost void of pollen. Thus, five Ohio coals having the physical characteristics of cannel coals and coming from sites where cannel coals have been previously identified were found not to contain the expected high percentage of palynomorphs that are characteristic of cannel coals.

3:45

DRAINAGE REVOLUTION FOSTERED BY LAKE TIGHT. Richard P. Goldthwait, Professor  
Emeritus, Department of Geology and Mineralogy, The Ohio State University,  
Columbus, Ohio 43210

Recent magnetic research has established the Minford Clays of Lake Tight to be laid down in Matuyama (early Quaternary) time. Between that early glacial blocking (690,000 to 2 million years ago) and Illinoian glaciation, which left drift over and in lower Teays Valley, the whole stream pattern in south central Ohio was completely altered and dug down deeper than even the present rivers. The northwestward dendritic pattern of Teays River



became converted to a southward parallel pattern of Deep Stage. This cannot all be attributed to tilting and piracy, because the strath gradients before and after are well suited to both main rivers. We are driven, as was John L. Rich before us, to presume a lacustrine clay filling in the old Teays valleys that obscured all previous valleys and was vastly thicker than the truncated relic bits we drill out today (rhythmic clays 10 to 80 feet thick). We find tributary headwater clays up to 820 feet a.s.l. on divides now, but the original lake sediments must have reached the 900-foot contour to allow the early postglacial streams to wander from one shallow depression to another right through cols in high ridges. This was a revolution in the drainage pattern. Today with 100-foot deep lake sediments eroded away everywhere, at least three quarters of the ancient sediment is gone. A thin (2' to 14') cloak of colluvium is still maintained on the eroding clay slopes, and a 3- to 10-foot loess blanket covered everything in late Quaternary.

- 4:00 CURIOUS ICE FLOW FEATURES IN THE CENTRAL PART OF THE GREENLAND ICE SHEET. Ian M. Whillans and Alice J. Drew, Institute of Polar Studies, Department of Geology and Mineralogy, and Department of Geodetic Science and Surveying, Ohio State University, 125 South Oval Mall, Columbus, Ohio 43210.

During the summers of 1980 and 1981 satellite and conventional surveys were conducted on the ice sheet to determine ice movement with a view to describing the dynamics of that ice sheet and correcting the new Dye-3 ice core record for the effects of ice flow. The first results are now available and although there is general agreement with theory there are notable exceptions. Firstly, ice 5 to 10 km east of the ice crest is flowing westward. Possible explanations for this include a recent migration of the ice divide or a contrast in basal relief such that the western side of the ice sheet is pulling ice from the eastern slope. Secondly, ice near the bed at one place appears to be nearly stagnant. This may indicate a shortcoming in glacial flow theory or again a change in the position of the ice divide. Thirdly, disturbances to the flow by subglacial hills are much larger than expected. Currently we have no clear explanation for this but maybe we will be the time of the meeting.

- 4:15 LONGITUDINAL STRESS IN GLACIER FLOW. Richard B. Alley and Ian M. Whillans, Department of Geology and Mineralogy and Institute of Polar Studies, Ohio State University, Columbus, Ohio 43210.

Most models for glacier flow assume that the only important stresses are shear stresses along nearly horizontal planes. We have developed a model that explicitly includes along-the-glacier, or longitudinal, stresses. This allows us to better evaluate effects on the ice sheet of changes near the terminus, such as formation or disintegration of a confined ice shelf, and also gives us greater freedom in modelling bottom sliding. We assume two-dimensional flow of incompressible ice over a horizontal bed according to a power-law-creep constitutive relation, and average horizontal velocities and longitudinal stresses over depth. This yields a system of three equations in terms of longitudinal stresses, horizontal flux gradients, ice thickness ( $h$ ) and its time-rate of change, accumulation rate ( $b'$ ), and constants. Measured  $b'$  and  $h$  from a steady-state ice sheet allow numerical solution of these equations for longitudinal stresses, horizontal flux gradients, and the constant in the constitutive relation (A). The steady-state solution for East Antarctica reveals: 1) Longitudinal stress exhibits maxima at the ice divide and the terminus, with a broad minimum between; 2) The constant A increases with horizontal distance ( $x$ ) from the ice divide because temperature increases with  $x$ ; 3) If the constant A were independent of  $x$ , then  $b'$  would need to be only weakly dependent on  $x$  to maintain steady state. Nonsteady-state response to changed boundary conditions is modelled starting from the steady-state solution.

- 4:30 STRATIGRAPHY AND CLAY MINERALOGY OF WISCONSIN TILLS IN THE CUYAHOGA VALLEY, SOUTHERN CUYAHOGA COUNTY, NORTHEASTERN OHIO. Fernandez, R.L. and Szabo, J.P., Department of Geology, University of Akron, Akron, OH 44325.

Five Wisconsinan tills crop out in the Cuyahoga Valley in southern Cuyahoga County. Mid-Wisconsinan Mogadore Till is restricted to isolated outcrops protected by bedrock. Its firm, stony nature is in sharp contrast to plastic, calcareous Northampton till which crops out throughout the area. The Northampton till consists of two beds separated by lacustrine deposits. The lower bed is nearly 11 meters thick at several locations. Sandy Late Wisconsinan Kent (?) Till overlies Northampton till in Garfield Heights south of Rockside Road. Lavery and Hiram Tills are restricted to upland areas.

Clay mineralogy of the tills is dominated by illite. Among the tills, the ratio of illite to kaolinite and chlorite (diffraction intensity) increases as age decreases. The diffraction intensity of the Northampton till is 1.5 which is quite similar to that of the same till in Summit County to the south. It is slightly greater than that of the Mogadore Till but less than that of the Lavery Till. In weathering profiles the ratio increases as chlorite alters to vermiculite. A weathering profile is developed in the upper part of the Northampton till where it is overlain by Kent (?) Till. This tentatively allows assignment of the Northampton till to the Mid-Wisconsinan Substage.

## 4:45 COMPARISON OF GLACIAL DEPOSITS WITH THE RESULTANT PEDOLOGIC PROFILES - STARK CO. OHIO

James R. Bauder, 3095 Bernewood Dr. N.W., Canton, Ohio 44709

Field studies have shown that the depositional mode of the parent material has a very significant effect upon the development of the soil profile in it.

Ablation and lodgement till deposits of the same glacial event differ in: clay, silt, sand and gravel content; bulk density, structure and potential permeability.

For the same glacial event, a lower clay content soil catena usually develops in the ablation till than typically develops in the lodgement till.

The extent and thickness of the silty mantle over till, outwash and residual materials is dependent upon deposition and erosion.

## D. MEDICAL SCIENCES

FIRST MORNING SESSION, SATURDAY, APRIL 23, 1983

PSYCHOLOGY BUILDING, ROOM 102

LARRY J. REAM, PRESIDING

8:30 COUPLING OF MALATE UTILIZATION WITH ELECTRON TRANSPORT IN HYMENOLEPIS DIMINUTA (CESTODA) MITOCHONDRIA. Jeffrey R. McKelvey and Carmen F. Fioravanti, Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

The adult intestinal helminth, Hymenolepis diminuta, utilizes malate as the mitochondrial substrate for anaerobic phosphorylation via the electron transport-coupled, NADH-specific, fumarate reductase system. In addition to the fumarate reductase, H. diminuta mitochondria also catalyze a lesser oxidase activity. As assessed polarographically, this oxidase was rotenone-sensitive and  $Mn^{++}$  ion-dependent. When NAD(P)H served as the substrate, oxidase activity resulted in peroxide accumulation and, under the assay conditions, NADH was preferred. Because it results in peroxide formation, the oxidase appears to be of limited physiological significance. However, it was possible to use the oxidase to assess the metabolic sequence by which malate oxidation couples to electron transport in the H. diminuta system. Accordingly, rotenone-sensitive, malate-dependent oxygen consumption by disrupted H. diminuta mitochondria, in the presence of  $NAD^+$  and  $Mn^{++}$  ion, was significantly enhanced by adding  $NADP^+$  to the system. These data supported the hypothesis that malate utilization occurred via the  $NADP^+$ -specific "malic" enzyme, producing NADPH. In turn, the NADPH: $NAD^+$  transhydrogenase acted to produce NADH for electron transport function. Supported by a Grant-in-Aid of Research, Sigma Xi, and by NIH AI-15597 and AI-00389, USPHS.

8:45 MITOCHONDRIAL CYTOCHROME C REDUCTASE AND OXIDASE ACTIVITIES OF ADULT HYMENOLEPIS DIMINUTA (CESTODA). Younghee Kim and Carmen F. Fioravanti. Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Hymenolepis diminuta is considered to be physiologically anaerobic in terms of mitochondrial energetics. This cestode utilizes an electron transport-dependent fumarate reductase for the site I-generation of ATP. However, H. diminuta mitochondria exhibit a lesser, electron transport-coupled, rotenone-sensitive, peroxide-forming, NADH oxidase which is relatively insensitive to antimycin A, cyanide and azide. The present study demonstrated that H. diminuta mitochondria also displayed membrane-associated, NAD(P)H and succinate-cytochrome c reductase activities. The NAD(P)H-cytochrome c reductase activity was sensitive to rotenone and antimycin A, but not to cyanide, while the succinate-cytochrome c reductase was inhibited by antimycin A. Under the conditions of assay, NADH was the best reductant for cytochrome c. In keeping with the activity of an NADPH:NAD transhydrogenase, NADPH-dependent reduction of cytochrome c was enhanced by NAD. H. diminuta mitochondria also catalyzed a membrane-associated, cyanide-sensitive, cytochrome c oxidase activity. Cytochrome c peroxidase activity was catalyzed by the mitochondrial membranes, but cytochrome c oxidase was demonstrable in the presence of catalase. Although the physiological role(s) of these activities remains to be determined, the data suggest that both the reduction and oxidation of cytochrome c represent a branching of the electron transport mechanism. Supported by NIH RR-07192, AI-15597 and AI-00389.

9:00

THE PRESENCE OF A CYTOCHROME C-LIKE PROTEIN IN ADULT HYMENOLEPIS DIMINUTA (CESTODA). Duane D. Culler and Carmen F. Fioravanti. Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

The physiological role of cytochrome c in aerobic mitochondrial electron transport chains is clearly established. Adult Hymenolepis diminuta displays an ostensibly anaerobic metabolism with respect to mitochondrial energetics. Recently, Kim and Fioravanti (1983) detected cytochrome c reductase and oxidase activities associated with H. diminuta mitochondrial membranes, employing horse-heart cytochrome c as a substrate. These findings prompted an investigation of the possible presence of cytochrome c in the anaerobic cestode. The data obtained demonstrated that H. diminuta tissue contains a protein with characteristics simulating those of horse-heart cytochrome c. The reduced H. diminuta protein exhibited absorption peaks at 550, 500 and 412 nm corresponding to the  $\alpha$ ,  $\beta$ , and  $\gamma$  bands of reduced horse-heart cytochrome c. Based on the quantity of cytochrome c-like material of H. diminuta and a consideration of mitochondrial protein content, the helminth material would represent 0.18% of the total mitochondrial protein. Whether the endogenous protein has the same degree of reactivity as horse-heart cytochrome c, in terms of the cestode's reductase and oxidase activities, remains to be determined. However, the presence of a cytochrome c-like protein in H. diminuta suggests that the essentially anaerobic electron transport chain contains a branch which mimics, in part, the mammalian electron transport chain. Supported by NIH AI-15597 and AI-00389.

9:15

MECHANICAL PROPERTIES OF THE NETWORKS OF ELASTIC FIBERS IN THE CANINE PROXIMAL LATERAL SAPHENOUS VEIN. William H. Guilford and Robert S. Crissman. Department of Anatomy. Medical College of Ohio, C.S. 10008. Toledo, Ohio 43699.

Elastic fibers have been viewed as important for distribution of stress around venous walls. In the present study, the mechanical properties of an individual component, elastin, have been determined on the basis of its physical arrangements. Proximal segments of canine lateral saphenous veins were removed post mortem and extended to in situ length in a 37°C physiological saline bath. Segments were pressurized using a syringe pump dispensing a known volume per unit time. Pressure, time and change in length were recorded with pressure and force transducers on a Grass polygraph. Wall strains were calculated and individual fiber stresses were determined using equations developed from known fiber configurations. The stresses on primary (i.e. longitudinal and oblique) fibers calculated to be different but on the order of  $10^6$  dynes/cm<sup>2</sup> when the vessel is extended to in situ length at 0 mmHg. At pressures below 32 mmHg, longitudinal fiber stresses exceed oblique fiber stresses. At 32 mmHg, the stress within longitudinal and oblique fibers of the internal elastic lamina become equalized at  $3.5 \times 10^6$  dynes/cm<sup>2</sup>. Above 32 mmHg, oblique fiber stress exceeds longitudinal fiber stress. Small circumferential fibers appear to play only a small mechanical role in the vessel wall until 40 mmHg when their stresses reach the order of  $10^6$  dynes/cm<sup>2</sup>. Similar results were obtained for the elastic fibers in the network distributed throughout the venous wall.

9:30

THE EFFECT OF UPPER BODY EXERCISE ON ELECTROCARDIOGRAPHIC WAVEFORM RESPONSE AMONG OLDER MEN. B. Girten, R. Gandee, K. Mahony, A. Narraway, and A. Heiselman. University of Akron, Akron, Ohio 44325, Akron General Medical Center and Litchfield Rehabilitation Center, Akron, Ohio 44307.

Alterations in amplitude of electrocardiogram R-waves were examined in ten older males during wall pulley arm exercise. The subjects ranged in age from 35 to 75. All were free of symptoms of coronary heart disease and demonstrated normal resting and exercise electrocardiograms. The wall pulley arm exercise protocol used was similar to that used in some rehabilitation programs, but involved slight modifications to enable standardization of movement. The exercise format consisted of alternate arm pulldowns with each arm moving through a 90° range of motion at a frequency of 30 times per minute. The duration of activity for each workload was seven minutes and involved two workbouts of three minutes. Workload sequences were randomized and sufficient recovery time was provided between tests. R amplitudes (mm) were determined from the isoelectric line to the peak of the positive deflection of the normal QRS complex. Lead V<sub>5</sub> was selected to examine the electromotive forces of the left ventricular function of the heart during the first and last minute of exercise at each workload. The measured values indicate that R remains constant during the first minute of exercise across all workloads, while the decrease in R between the first and last minute of exercise becomes larger as workload increases. These findings have implications concerning ventricular function of older men during upper body exercise, and tend to concur with previously reported information concerning R-wave response to exercise among healthy individuals.

9:45

ASBESTOS IS A POTENTIAL THREAT TO PESTICIDE USERS. Karl Schurr, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Commercial use of asbestos has commonly caused contamination of natural aquatic environments at levels of  $10^{12}$  fibers per liter. Chrysotile asbestos fibers can kill Artemia, modify metamorphosis of Galleria, destroy the lateral line of coho

salmon and cause large tumors resulting in the death of young fish. The public health dangers have been adequately documented by several researchers. If the present relatively high levels of asbestos pollution are accentuated by exposure to pesticides on a talc dust carrier, an immediate health threat is likely. Asbestos fibers are found at variable quantities in talc. Furthermore, the use of tobacco by smoking causes a synergistic potentiation to lung cancer on the part of humans who are exposed to asbestos. Some pesticides are carcinogenic. A possible synergy between the pesticide and asbestos fibers present in the carrier dust has not been investigated. The several lines of evidence linking asbestos as a major environmental insult (and the unproven, but likely, synergism of asbestos and some pesticides in carcinogenesis) should cause a careful reevaluation of the use of asbestos containing talcs as carriers for pesticides.

10:00 FATAL COLCHICINE TOXICITY.  
Atindra N. CHATTERJI, M.D., 799 Kelford Place, Trotwood, Ohio 45426

Colchicine, an alkaloid, is effective for the treatment and prevention of acute attacks of gouty arthritis and is used both orally and intravenously. Despite its antimitotic action, severe and potentially fatal toxicities have been exceedingly rare except in patients, who received overdosage of the drug.

A case report of a 65-year-old white male is presented who developed pancytopenia associated with markedly hypocellular bone marrow, abnormal liver function tests, hypotension, and probable neurotoxicity after intravenous administration of a total dose of twelve milligram of colchicine over a period of five days for acute gouty arthritis. There was some evidence of recovery of hematopoiesis four days after the last dose of colchicine, even though there was a fatal outcome.

In addition, cases of colchicine-induced marrow aplasia, including fatal colchicine toxicities reported in English literature are reviewed<sup>2</sup>.

1. Wallace, S.L.: The treatment of gout. *Arthritis Rheum.*, 15: 317-323, 1972.
2. Liu, Y.K.; Hymowitz, R.; Carroll, M.G.: Marrow aplasia induced by colchicine. *Arthritis Rheum.*, 21: 731-735, 1978.

10:15 CERTAIN ASPECTS OF ROLLER AND PULSATILE PUMP DYNAMICS.

P. D. Beckley, M.S. and K. M. Hanson, Ph.D.. Division of Circulation Technology and Department of Physiology, The Ohio State University College of Medicine, Columbus, Ohio 43210.

Roller pumps are used in research and clinical practice for the delivery of various perfusates into either in vitro or in vivo preparations. A study was done to determine the affects of occlusive setting, temperature of the perfusate and viscosity of the perfusate on stroke output from the pump. It was found that the stroke output of the totally occlusive roller pump did not significantly differ from the clinically acceptable slightly non-occlusive pump over all flow ranges. Changes in perfusate viscosity did not significantly affect the pump stroke output but changes in perfusate temperature did affect output. As the perfusate was cooled, pump output decreased. It was also found that pump output varied for each temperature depending upon the wall thickness and type of tubing employed. The clinical significance of each of these findings will be discussed as related to the perfusion support of the open heart patient. Clinically, several methods are available to provide pulsatile perfusion as opposed to the inherent non-pulsatile nature of the standard roller pump. These methods will be discussed and a comparison of pulse pressure generation will be made.

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## D. MEDICAL SCIENCES

SECOND MORNING SESSION, SATURDAY, APRIL 23, 1983

PSYCHOLOGY BUILDING, ROOM 113

JANE N. SCOTT, PRESIDING

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8:30 MORPHOMETRIC ANALYSIS OF AGE-RELATED CHANGES IN ADRENAL ZONA RETICULARIS CELLS.  
Arlene T. Klak and Lee A. Meserve. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH. 43403

Electron microscopy reveals three outstanding ultrastructural features of mammalian parenchyma cells of the adrenal cortex. First, there is an abundance of smooth ER and absence of rough ER. Second, the cortical mitochondria differ structurally from those of

most other cells, the cristae appearing vesicular or tubulo-vesicular in the zona fasciculata and zona reticularis. Third, numerous large fat droplets or lysosomes are often found. As the animal gets older, hormonal changes occur which can be reflected in the size or proportion of organelles within adrenal cells. In this study, changes in the adrenal zona reticularis were observed in one and 13 month old mice. Ultrathin sections were observed and photographed with an Hitachi HS-8 F-1 electron microscope. A test pattern of 100 points was used to determine the percentage of various organelles in 50 micrographs. When analyzed by t-test (5% level of significance), the mean percentage of ER was greater in the older animal samples, as was the vesicular mitochondria, but the tubulo-vesicular mitochondria was greater in the one month old mice. These results seem to indicate that the rate of centripetal movement of cells in the older animals is different than in the younger animals.

8:45

DEPRESSED HYPOTHALAMIC CORTICOTROPIN-RELEASING FACTOR ACTIVITY IN 15 DAY OLD RATS EXPOSED TO THIOURACIL FROM CONCEPTION. Lee A. Meserve and A. Frances Pearlmutter. Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403, and Department of Biochemistry, Medical College of Ohio, Toledo, Ohio 43699.

Previous *in vivo* studies have found feeding of thiouracil to pregnant and lactating rats to cause a delayed maturation of the hypothalamus-pituitary-adrenal (HPA) axis response to stress. While indirect measurements suggested a deficit in hypothalamic corticotropin-releasing factor (CRF), direct determination of the site of axis maturation delay was not made. We have used *in vitro* methods to separate the HPA axis components from the numerous confounding variables presented within the thiouracil-exposed animal, and to determine the functional capabilities of these axis components in 15 day old rat pups made hypothyroid by thiouracil. Analysis of the results of this study suggests that adrenal response to adrenocorticotrophic hormone (ACTH) and pituitary content of ACTH were not significantly modified by thiouracil exposure. However, thiouracil-induced hypothyroidism markedly reduced the CRF-like activity of hypothalamic extracts (4.0% vs. 84.0% of adult levels in thiouracil-exposed and euthyroid pups, respectively). These data support the notion that the hypothalamus is the site of delayed HPA axis maturation in young rats made hypothyroid by thiouracil.

9:00

THE EFFECT OF THYROID HORMONES ON HEPATIC CORTISOL SULFOTRANSFERASE ACTIVITY AND ON THE INDIVIDUAL HEPATIC GLUCOCORTICOID SULFOTRANSFERASES IN MALE RATS. Michael P. Carta and Sanford S. Singer, Department of Chemistry, University of Dayton, Dayton, Ohio, 45469.

Rat liver cytosol contains three enzymes which sulfate glucocorticoids. They were named STI, STII, and STIII in order of their elution from DEAE Sephadex A-50 columns. We have already described the gonadal, adrenal, and pituitary control of the production of these enzymes. This study was undertaken to gain a more complete understanding of the basis for the endocrine control of glucocorticoid sulfotransferase production. Male rats were injected daily with either triiodothyronine ( $T_3$ ) or tetraiodothyronine ( $T_4$ ) intraperitoneally for up to two weeks. Two doses of each hormone were tested. Rats were then sacrificed and their hepatic cortisol sulfotransferase activity (HCSA) was measured. One-week injection of  $T_3$  doubled the HCSA. Two-week injection of  $T_4$  produced no additional increase in HCSA.  $T_3$ -injected rats did not survive more than one week. Short-term injection regimens, one and two days, of either  $T_3$  or  $T_4$  had no effect on the HCSA. Fractionation of cytosols on DEAE Sephadex A-50 columns showed that STIII was the enzyme primarily affected by the hormone treatment. Additional experiments with castrated or adrenalectomized rats showed that the HCSA elevation was probably a direct effect of the thyroid hormones.

9:15

INVESTIGATION OF THE GLUCOCORTICOID SULFOTRANSFERASES OF GERBIL LIVER. Theresa A. Feeser and Sanford S. Singer, Department of Chemistry, University of Dayton, Dayton, Ohio 45469.

Extensive study in this laboratory has resulted in the purification and characterization of the glucocorticoid sulfotransferases of rat liver cytosol. These enzymes appear to be related to glucocorticoid-mediated enzyme induction, to hypertension and to some types of cancer in man and animals. To further examine the relevance of the glucocorticoid sulfotransferases, investigation of the enzymes that sulfate glucocorticoids in other species has been carried out. This report describes study of liver cytosol preparations from male and female gerbils. Modification of the enzyme assay method used with rat liver allowed us to optimize pH, protein concentration and time-course for the gerbil liver preparation and to determine optimum substrate and coenzyme concentrations to be used. Fractionation of gerbil liver cytosol on DEAE Sephadex A-50 columns gave characteristic glucocorticoid sulfotransferase elution profiles for the enzyme activity in both sexes. Fractions containing the main peak of enzyme activity were pooled and used for kinetic studies. The product of the enzyme reaction was identified. The molecular weight of the partially purified enzyme was determined and it was related to several other steroid sulfotransferases of gerbil liver. The rat and gerbil glucocorticoid sulfotransferases were compared.

9:30

THE GLUCOCORTICOID SULFOTRANSFERASE ACTIVITY OF HAMSTER LIVER. Robert L. Benak and Sanford S. Singer, Chemistry Department, University of Dayton, Dayton, Ohio, 45469.

This laboratory has long been involved in the study of the relation of glucocorticoid sulfotransferases to various biological processes. Most of these studies have examined hepatic glucocorticoid sulfotransferase activity (GCSTA) of male and female rats. The studies described here have been directed toward a comparison of hepatic glucocorticoid sulfation in hamsters and rats, using hydrocortisone as a model glucocorticoid. The purpose of this comparison is an overview of the similarities of the hepatic GCSTA in various animal species. To achieve these goals, an optimum assay for hepatic GCSTA in hamster liver was designed. The optimum substrate and coenzyme concentrations, time course limitations, and useful range of protein content were determined for the assay. Fresh liver cytosols from male and female hamsters were then eluted from DEAE Sephadex A-50 columns and the elution profiles of the GCSTA were examined. Since females were found to have significantly greater enzyme activity than males, studies of the effect of injection of estrogen into male hamsters were conducted to identify the role of the ovaries in control of enzymes mediating GCSTA.

9:45

THE CORTISOL SULFOTRANSFERASE ACTIVITY OF CHICKEN LIVER. Edward G. Galaska and Sanford S. Singer, Department of Chemistry, University of Dayton, Dayton, Ohio, 45469.

Previous research conducted in this laboratory has resulted in the purification and characterization of three enzymes that sulfate glucocorticoids in the rat. These enzymes appear to be potentially important in physiological and pathological glucocorticoid actions. To further understand the involvement of the glucocorticoid sulfotransferases in biological processes, investigation of the enzymes that sulfate glucocorticoids in other mammals has also been carried out. This report describes the preliminary characterization of the glucocorticoid sulfotransferases in livers of male and female chickens, a nonmammalian species that responds to glucocorticoids. Modification of the enzyme assay method used with rats allowed us to develop a quantitative assay in which optimum substrate and coenzyme concentrations, time course limitations, and a useful protein range were determined for chicken liver cytosol. Fresh chicken liver cytosol was then fractionated on DEAE Sephadex A-50 columns. This yielded characteristic glucocorticoid sulfotransferase elution profiles for the enzyme activity in both sexes. The kinetic properties of the glucocorticoid sulfotransferase activity in pooled DEAE Sephadex A-50 fractions was studied. Thin layer chromatography and gel electrophoresis were used to identify the product of cortisol sulfation by the chicken liver enzyme.

10:00

MICROORGANISMS OF THE HEALTHY CANINE EAR Steve Lange Dr. Percy Lilly Heidelberg College, Tiffin, Ohio 44883

Eighty one dogs were sampled for the determination of the normal microorganism community of the ear. The effects of different environmental conditions were noted. The microorganism community was found to be composed mainly of Proteus, coliforms, coagulase-negative Staphylococcus, alpha and non-hemolytic Streptococcus and diphtheroids.

Dogs with more exposure to the outdoors showed a significantly higher incidence of coliforms, yeasts, fungi and coagulase-negative Staphylococcus than did dogs with little outdoor exposure. Urban indoor dogs had a very high incidence of diphtheroids. Generally, the urban indoor dogs had a lesser variety of microorganisms compared to the rural dogs (both indoor and outdoor).

A possible evolutionary change in the composition of the microorganism community of the ear was detected. A comparison to a 1969 Australian study showed marked differences which were best explained as due to changes in the medical care of the dog population and to demographic differences between the studies.

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## D. MEDICAL SCIENCES

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

PSYCHOLOGY BUILDING, ROOM 108

LARRY J. REAM, PRESIDING

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1:30 BUSINESS MEETING

- 1:45 THE EFFECT OF PHOSPHATIDYLCHOLINE ON THE RETICULOENDOTHELIAL SYSTEM, AS DETERMINED BY CARBON CLEARANCE ASSAY. John C. Kappes, Yoshiki Tsuchiya and Leo G. Nutini. St. Thomas Institute 1842 Madison Rd. Cincinnati, OH 45206

It has been shown that random bred Swiss Albino mice, when prophylactically treated with phosphatidylcholine (PC), fraction isolated from commercial bovine lecithin, are provided greater than 80% protection from death against experimentally induced *Staphylococcus aureus* infection. Such protection was provided by a single intraperitoneal (IP) injection ranging from 1 to 7 days prior to challenge with *S. aureus*. We have now demonstrated that IP injections (4mg) of PC cause a stimulatory effect on the Reticuloendothelial System (RES), as indicated by a carbon clearance assay. One hour, six hours, one, two and three days post PC injection groups of mice were injected intravenously with a 16mg/ml colloidal carbon (0.5 ml/100g body weight). Three and thirteen minutes post carbon injection blood samples of 70 microliters were collected from the orbital plexus and analyzed spectrophotometrically for carbon concentrations remaining in the blood. The PC treated animals showed a stimulatory effect on the amount of carbon cleared for the 1, 2 and 3 day samples respectively. It was also indicated that PC had no effect on the RES 1 & 6 hours post PC injection.

- 2:00 THE ANTIVIRAL ACTIVITIES OF PHOSPHATIDYLCHOLINE IN VITRO. Michael J. Linke, Yoshiki Tsuchiya and Leo G. Nutini. St. Thomas Institute 1842 Madison Rd. Cincinnati, OH 45206.

Previous work done at our laboratory demonstrated that a phosphatidylcholine (PC) fraction purified from commercial bovine lecithin had a definite prophylactic action against experimentally induced staphylococcal infections in mice in terms of mortality. A study was then undertaken to determine the action of PC on viral infections. In vitro experiments conducted on the infectivity of the respiratory syncytial virus, assayed by the plaque - reduction method, showed the infectivity to be markedly reduced by the addition of PC. In order to correlate the in vitro antiviral activity of PC to an in vivo system Herpes Simplex Type I virus was chosen for further viral study. HSVI has been shown to cause death in mice when injected I.P. In in vitro experiments the multiplicity of infection of HSVI was significantly lowered by addition of PC. The multiplicity of infection was measured in plaque forming units/ml as assayed by the plaque - reduction method.

- 2:15 OXYGEN CONSUMPTION CHANGES IN BONE MARROW CELLS OF MICE IMPLANTED WITH RaVe LYMPHOBLASTIC LYMPHOMA. Gesinski, Raymond M. Department of Biological Sciences, Kent State University, Kent, Ohio 44242

Mice DBA/1J were used in this study. Oxygen consumption was measured with a yellow Springs Instrument Model 53 oxygen monitor. Bone marrow was obtained from femur and tibia-fibula of both rear legs. Average oxygen consumption expressed as  $\mu$ l oxygen consumed per  $10^7$  cells was: Normal bone marrow 0.24  $\mu$ l  $O_2$  per five minute interval; Tumor bearing mouse bone marrow 0.55  $\mu$ l  $O_2$  per five minute interval; Tumor cells 0.43  $\mu$ l  $O_2$  per five minute interval.

- 2:30 COMPARATIVE EFFECTS OF CORTEXOLONE AND CORTICOSTERONE ON IMMUNE RESPONSE IN THE MALE MOUSE: HEMATOLOGY AND SPLENIC LYMPHOCYTE REACTIVITY. Robert Taylor and J. R. Stevenson. Department of Biological Sciences, Kent State University, Kent, OH 44242

Six to eight week old intact C57BL/6 male mice were injected intraperitoneally with saline or varying doses of cortexolone (a glucocorticoid antagonist) or corticosterone daily for one week. Analysis of spleen cells for lymphocyte responsiveness to phytohemagglutinin (PHA) and plaque-formation against sheep red blood cells indicated an enhancement in the immune response in the cortexolone treated group and suppression in the corticosterone group. In the corticosterone group, T-cells exhibited a reduction in response to PHA stimulation while B-cells reactivity to lipopolysaccharide remain unchanged. Mice exposed to cortexolone showed leukocytosis, lymphocytosis and monocytosis. In contrast, mice injected with corticosterone exhibited leukocytopenia, lymphocytopenia and monocytopenia which was dose related. Both steroids induced neutrophilic leukocytosis. The results suggest that cortexolone may potentiate the immune response in vivo.

3:00 BREAK

3:15 THE EFFECTS OF THE GENUS VIOLA ON CANCER CELLS. Charlette N. Mingle and Assoc. Professor David J. Giron, Wright State University. 542 Margaret Dr. Fairborn, Ohio 45324

This scientific research project is an experiment continuing previous research on the plants of the genus Viola. Taking several plants of the genus, separate solutions are made from the active parts of the plants, the roots, and added to mice and human cancer cells. The cells are then observed for a period of days and receive a cell count.

3:30 THE ISOLATION AND PURIFICATION OF VERY LOW DENSITY LIPOPROTEINS BY FLATBED ISOELECTRIC FOCUSING. Freidel, J., Meloy, N., Cheever, C., Peetz, J., and Kilchenman, J. University of Cincinnati Medical Center, 234 Goodman St., Dept. of Lipid Research, K-Pavilion 3rd Fl., Cincinnati, Ohio 45267

By employing a stable pH gradient using carrier ampholytes, the plasma density less than 1.006 g/ml fraction containing the very low density lipoproteins can be separated based on their isoelectric points. This separation is achieved by flatbed isoelectric focusing, using a pH gradient from 4-6, which enables the isolation of apolipoprotein E, C, and A. The isolated proteins are removed from the flatbed and further purified by gel chromatography. The purification procedure using a sephadex column provides near complete removal of the carrier ampholyte. The isolated apoprotein is then verified by amino acid analysis and stored at -70°C.

This methodology is a relatively quick and efficient means by which to isolate proteins, including antibodies, hormones, and conjugated proteins.

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## E. PHYSICS AND ASTRONOMY

MORNING SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 266

JAMES MARSHALL, PRESIDING

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8:30 WIRE ROPE TORQUE. R. Fred Rolsten, Ph.D., CMfgE., Wright State University, M.P.O. Box 1604, Dayton, OH 45401, and D. Warren Knapp, P.E., Continental Grain Co., St. Louis, MO 63178

The operating characteristics of a wire rope must be understood by the design engineer if a wire rope is to be used safely and to the fullest advantage. One



characteristic which is frequently troublesome is the inherent torque that develops when the wire rope is in normal use under a tensile load. Another characteristic which may be dangerous is the trapped torque that develops when the wire rope is improperly installed.

As an example of inherent torque a 1-3/8" diameter lang lay rope with a lay of 8.80" and strand lay of 3.74" was observed to exhibit 0.204-inch pounds of torque per pound of applied tension. By means of the developed equations presented in this paper the calculated inherent torque was 0.205-inch pounds per pound of applied tension which is in excellent concordance with the experimental value.

- 8:45 PLATES ON ELASTIC FOUNDATION WITH VARIABLE MEDIA. Salahuddin Ahmed, Graduate Student, Civil Engineering Department. The University of Toledo, Toledo, Ohio 43606  
Benjamin Koo, Ph.D., Professor, Civil Engineering Department, The University of Toledo, Toledo, Ohio 43606.

Load bearing plates or slabs supported by variable media can be found in a large variety of engineering applications such as, airport runways, highway pavements, mat foundations of structures, etc. The analysis consists of the solution of a mathematical model of a fourth order linear partial differential equation with constant coefficients (so-called 'biharmonic equation'). A solution can be obtained by means of a Fourier Series expansion. Unfortunately, the result being so involved and complicated presents difficulties for practicing engineers to use. Moreover, to get a fairly accurate result out of the infinite series representation takes a lot of computer time. To alleviate the problem, a numerical solution based on the finite difference equations is developed. An efficient computer program has been developed to handle both concentrated and distributed loads on a rectangular plate having support conditions with either fixed, hinged or any combination, with simple, easy and direct user input. The computer generated answers check very well with the analytical one, usually within three percent error. The program is, therefore, judged to be very suitable for use by practicing engineers who are in search of an answer in this area.

- 9:15 A STATIC ANALYSIS OF BEAMS AND TRUCK FRAMERAILS. R. Fred Rolsten, Ph.D., Wright State University, M.P.O. Box 1604, Dayton, OH 45401, Claude R. Austin, Avionics Laboratory, Wright-Patterson Air Force Base, OH, Richard A. Detamore, ASD, Wright-Patterson Air Force Base, OH.

The basic concepts governing the analysis of beams are related to framerail analysis and a digital computer program is utilized for an analysis of the A/S 32P-4 Fire-Fighting Truck used by the Air Force. The method used by the truck manufacturer was to divide the beam into two sections at the front axle. They then determined the shear and moment at that point to replace the truncated section. However, with the program presented in this paper, that method is unnecessary. The beam can and should be considered over its entire length. Through the use of singularity functions, the deflection at the end of the beam can be determined easily. A second beam, a siderail designed and supplied by the manufacturer was for a larger truck, i.e., the P-4 vehicle. The loading was entirely concentrated, except for the weight of the beam, which was a uniformly distributed load. The computer program solution to these problems revealed the excellence of the method.

- 9:30 TREATMENT OF ACID MINE DRAINAGE WATER WITH ALKALINE BY-PRODUCTS AND LIME BLENDS. David J. Karl, R. Fred Rolsten, George A. Carmody and M. Elizabeth Karl, Departments of Chemistry and Engineering, Wright State University, Dayton, Ohio 45435

The ability to treat Acid Mine Drainage waters (AMD) with various types of cement and lime kiln dusts and blends of these materials with lime products, has been studied in the laboratory and examined in field tests.

Laboratory experiments provided a correlation of the composition, available lime index and capacity to treat synthetic AMD samples. In all cases the materials tested showed greater efficiency in treating synthetic AMD than the available lime index would suggest.

Field tests were carried out at several AMD treatment plants in the northern W. Va. area using a variety of these test materials. In this work, raw water flow rates and chemistries (pH, acidity and iron concentrations) and treated water chemistries at various points in the treatment process, including finished water, were monitored as a function of chemical formulation and feed rate. Material efficiencies as high as 90% of the theoretical value based on pure calcium hydroxide and over 100% based on actual commercial lime usage were obtained with blended materials. Compared to hydrated lime, these materials showed more stable pH, more efficient iron removal, and more rapid settling to produce a more dense sludge. A proprietary blend based on this work has been successfully marketed under the trade name Alka-Ment<sup>®</sup> by The Allyn Corporation of Worthington, Ohio.

9:45 CEMENT PLANT PRE-HEATER MODELING. R. Fred Rolsten, Ph.D., Patrick J. Sweeney, Ph.D., P.E., David J. Karl, KL 361, University of Dayton, Dayton, OH 45469.

This report discusses how a unique 1/10 scale lucite model of a four stage cement plant pre-heater was constructed and used as a test vehicle for evaluating the internal aerodynamics of pre-heater design changes. In order to attempt to improve the mass through-put efficiency of the pre-heater it was hypothesized that if the pressure drop throughout the four-stage pre-heater was reduced, the efficiency would increase. Several pre-heater stage modification combinations that would alter the cross sectional areas of both the inlet and exhaust ducts and/or alter the thimble length were suggested by a manufacturer. An inspection of the actual plant operational four stages of the pre-heater and the ducts revealed an enormous build up of material at the entrance of all stages. A model of a single stage was used to measure the pressure at both the inlet and exhaust positions, to determine the pressure drop, and to extrapolate these data to four stages so that the entire pre-heater gains and/or losses could be estimated reliably. The experimental data revealed that the major contributor to the pressure drop within any single pre-heater stage was the material build up at the inlet which effectively reduced the inlet cross sectional area. The test data also showed that the modified design would not significantly reduce and/or eliminate this material build up and that the proposed modified versions were not a significant improvement over the current design. It was concluded that any design that reduces or eliminates pre-heater material build up could result in improved through-put productivity. This work validates the decision to utilize an inexpensive scale model to evaluate high-cost plant modifications.

10:00 HUMAN FACTORS CRITIQUE AND DESIGN OF A HYDRAULIC SYSTEMS TEST STAND. Jon Julien, A.K. Click, Steve Sanders, Laura Scandura, and Richard Gill. Wright State University, Dept. of Engineering, Dayton, OH, 45435.

The Air Force has long been a leader in Human Factors research and design. Due to military mission priority, though, the majority of their efforts have been directed toward the aircraft and not the ground support equipment. A prime example is the Hannon Gas Hydraulic Test Stand, Model MJ280, which is used to simulate the in-flight function of an aircraft hydraulic system for ground maintenance and repair. A task analysis was employed to identify any basic design deficiencies; a complete lack of functional grouping and no consideration for sequence of use were found to be the major problems. Additionally, the fundamental principles of color coding, shape and tactile coding, and clockwise movement for increase were also consistently violated. For the redesign of the Control/Display panel, three major design tools were employed: (1) the previously performed task analysis; (2) the basic human factors design steps; and (3) all fundamental human factors guidelines as identified in Military Standards 1472B. A subjective link analysis and operator opinion of the new design were both very favorable.

10:30 A HUMAN FACTORS CRITIQUE OF A HYDRAULIC POWERED INDUSTRIAL SEWER CLEANER. David Ingle, Gary Dabney, Kathy Schert, Tony Beckett, and Richard Gill. Wright State University, Dept. of Engineering, Dayton, OH, 45435.

In recent years, Human Factors has evolved into an organized discipline primarily through the research efforts of the defense industry. However, Human Factors design principles are not limited to only military applications. They can and should be incorporated into all man-machine systems, thereby increasing performance, efficiency and safety with minimal effect on cost. To illustrate how the application of Human Factors principles can improve the effectiveness of a man-machine system, a typical municipal sewer cleaning system, the Ford-O'Brien Jet C L Hydraulic Sewer Cleaner was selected. This piece of equipment was chosen because it is operated by blue collar workers with limited educational background, involves a task that is non-trivial and uses hydraulic pressures sufficiently high to present a potential safety hazard. After identifying the basic tasks to be performed by the system, it was found that the existing design violated the Human Factors design principles of importance, frequency of use, sequence of use, and functional grouping. Additional problems were found to be the lack of color coding, inconsistent labelling and presenting quantitative data when qualitative or status information would be not only sufficient but preferred. The control/display panel was redesigned applying fundamental Human Factors design steps and principles. The resultant design is easier to learn to use, is less likely to result in "operator error", and met with favorable subjective evaluations from current users.

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## E. PHYSICS AND ASTRONOMY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 266

JAMES MARSHALL, PRESIDING

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1:30 BUSINESS MEETING

- 2:00 IMPACT TESTING OF A COMMERCIAL (MOTORCYCLE) IMPACT PROTECTIVE HELMET. R. Fred Rolsten, Ph.D., Wright State University, M.P.O. Box 1604, Dayton, OH 45401 and Joseph L. Haley, Jr., U.S. Army Aeromedical Research Laboratory, Ft. Rucker, AL 36362

Impact tests were conducted on two non-identified standard, commercial motorcycle helmets in accordance with American Standards Association Z90.1 Test Methods. The helmets were constructed with a typical 4mm plastic shell and a relatively thin 12mm expanded foam liner. A total of 16 metal head form impacts (8 per helmet) from 4.2 up to 6.9 meters per second were conducted. By comparison of the reaction force of the helmet impact as well as the acceleration of the head form, the helmets permitted transmission of injurious forces at all levels of energy beyond approximately 4.5 meters per second helmet impact velocity. The authors base this conclusion on helmeted-head impact tolerance data derived from the Wayne State University head impact tolerance curve developed in the '40s, '50s, and '60s; this data shows that peak head accelerations in excess of 150g are likely to cause concussions. It is concluded that the helmet would probably provide adequate protection by doubling the thickness of the 12mm thickness energy-absorbing liner.

- 2:15 LIMITS TO SAFETY. F.J. Jankowski. Wright State University, Department of Engineering, Dayton, Ohio, 45435.

In a comparison of safety records in industry and air transport, the United States is often found in fourth or fifth place, rarely in first or second. A rough correlation is observed between safety ratings and a Quality of Life Index which is based on a broad spectrum of factors. Holland, the Scandinavian countries, and Australia often rank above the USA in safety and in the Quality of Life Index. It is hypothesized that safety is limited by the degree of aggressiveness, prone to risk taking, and dissatisfaction within a society; lower values of these factors contribute to a higher value of the Quality of Life Index. Therefore a correlation is expected between the degree of safety and the Quality of Life Index, which may prove to be an upper limit to safety.

- 2:30 THE DYNAMICS OF BODY ARMOR. R. Fred Rolsten, Ph.D., C.Mfg.E., David J. Karl, Ph.D., Wright State University, M.P.O. Box 1604, Dayton, OH 45401 and Joseph Haley, Jr., U.S. Army Aeromedical Research Laboratory, Ft. Rucker, Alabama 36362.

The purpose of body armor is to prevent a projectile from inflicting injury to its wearer. Even though the projectile may not completely penetrate the armor, the wearer may be injured from the dynamics of the rear surface deformation, i.e., rear surface signature. Military experience showed that impact from the calibre .30AP bullet on ceramic body armor can cause serious, but survivable injury. An impact load of 3000 ft-lbs subjects the wearer to a 1200 ft-lb jolt. Military personnel surviving a bullet impact on their body armor are displaying myocardial contusion 10-to-15 years post impact. A good correlation has been made between laboratory testing and field evaluation results as they relate to the dynamics of the armor response and blunt trauma.

- 3:00 DYNAMICS OF A KARATE IMPACT. R. Fred Rolsten, Ph.D., Michael Gribler, Peter G. Gatchell, Wright State University, M.P.O. Box 1604, Dayton, OH 45401, John Wells, U.S. Army Aeromedical Research Laboratory, Ft. Rucker, AL 36362

A karate expert can break stout slabs of wood with his bare hand without sustaining personal injury. The maneuver is so extravagant that it is often dismissed as one of deception or illusion, but in fact there is no trick involved. The key experimental finding is that the hand of the karateka can develop a peak acceleration of 28-g's and a peak velocity of 11 ft/sec. The maximum deformation of the human hand was observed to be in the wrist. The event of the highly instrumented karateka hand was monitored with high-speed photographs.

- 3:15 IMPROVED QUICKENED DISPLAYS. Dr. Richard Gill, Wright State University, Dept. of Engineering, Dayton, Ohio 45435.

A higher order system is one in which the number of time integrations between the input and output is two or more. The design of alternative display/control techniques to aid in the control of such systems is one of fundamental concern for Human Factors Engineers. Display quickening, a technique first introduced in the 1950's, has been shown to be effective in helping operators to control such systems. In short, rather than displaying system output a quickened display displays a weighted sum of all state variables. If certain assumptions concerning operator behavior are made, then the optimal weightings can be analytically derived; namely, the ratio of 1:4:8 for position, velocity, and acceleration. These weightings have been used exclusively both in experimental investigations and real-world systems. However, the results of our empirical investigation revealed such coefficients to be suboptimal. The traditional feedback coefficients resulted in operator's developing a control strategy or internal model that was a linear weighting of the state variables, when the optimal internal model should have included a quadratic weighting on velocity. Quantification of the operator's internal model can be used to estimate a better set of feedback coefficients.

- 3:45 A MICROPROCESSOR CONTROL FOR VARIABLE SPEED AC MOTOR DRIVES  
Ponlee Li Dept. of E.E., The University of Toledo, Toledo, Ohio 43606

A microprocessor makes possible an economical pulse width modulation (PWM) technique to drive the inverter circuits for a three phase induction motor. The properties of a microprocessor system simplify the task of generating outputs of different frequencies and voltages of multiple phases. The implementation of a microprocessor controller for the inverter control utilizes software to execute control algorithms. Once the flow chart of the control sequence has been developed, a computer program can be generated to control specified waveforms. The incoming steady dc line voltage is inverted through an inverter and is chopped up by control circuitry into pulses of varying width. The pattern of pulses varies with required motor speed. This pattern is also constrained by eliminating lower order harmonics and can be predetermined by the numerical analysis such that undesirable harmonics are reduced or eliminated. The pattern is repeated through control circuitry to obtain three identical waveforms spaced 120 electrical degrees to simulate a 3-phase line. These voltage waveforms are then applied to the motor under control. Moreover, the lower the harmonic content of output waveforms, the less expensive filters are needed to give a closer approximation to the sinusoidal waveform, which results in smoother control at low speeds.

- 4:00 FAST ALGORITHM DEVELOPMENT OF SPECTRAL ESTIMATION  
Koji Ogino and Muzlifah Mohd Ali  
Department of Electrical Engineering  
Ohio University, Athens, Ohio 45701

Rational spectral estimation is mainly classified into MA (moving average) model, AR (autoregressive) model and ARMA (autoregressive and moving average) model. Recently, ARMA model is found to yield better spectral performance than the others, because of the efficient use of model parameters. In light of the recognized feature of ARMA method, fast algorithms to estimate parameters of ARMA rational model are developed. Methods do not require any data modification techniques which have been generally used to develop computationally fast algorithms. The development of fast algorithms is based on shift invariant structure of the covariance matrix. The number of arithmetic operations (i.e. multiplications) is reduced from the order of  $p^3$  to the order of  $p^2$  with  $p$  being the number of denominator coefficients of ARMA model. Applying ladder structures on fast algorithms, computation is further reduced to the order of  $p$  at arrival of each new data point. Fast algorithms are programmed and tested on the classical problem of detecting the presence of sinusoids in additive white noise. Numerical results clearly demonstrated computational efficiency and high quality of spectral estimate.

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## F. GEOGRAPHY

MORNING SESSION, SATURDAY, APRIL 23, 1983

HANNA HALL, ROOM 205

JOSEPH SPINELLI, PRESIDING

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8:30

## SPATIAL AND TEMPORAL TRENDS IN OHIO'S UNEMPLOYMENT: 1981:82

Dr. Charles B. Monroe, Department of Geography, University of Akron, Akron, OH 44325.

The state of Ohio has been severely affected by unemployment in its labor force.

Over the last several years, Ohio has consistently ranked among the top states in rate of unemployment, placing it significantly higher than the national average. This paper examines recent spatial and temporal trends in unemployment by county for the state. Using a clustering algorithm and rates of unemployment tabulated for the 88 counties of Ohio by the state's Bureau of Employment Services, a small number of unemployment regions are derived for the state. The counties contained in each region exhibit a similar profile in unemployment over the 1981-82 period. Whereas the pattern of unemployment in most Ohio counties corresponds to one of the regional groupings, several counties are "outliers" in that their unemployment trends are individual or isolated. Ohio's high statewide unemployment rate has generally been attributed to a large reduction in the labor force producing automobiles and related products. The county-level unemployment data for Ohio is analyzed in association with the previous employment structure within the state to determine linkages between types of employment and the level of unemployment. Results tend to show less unemployment in those areas with "fast-growing" activities such as wholesale-retail trade, services, and finance-insurance-real estate.

8:45

## THE STATE OF OHIO'S FOOD SUPPLY

Vern R. Harnapp

The University of Akron  
Akron, Ohio 44325

This study examines the condition of Ohio's food supply as it existed in 1981.

Production and consumption of over 60 food items commonly consumed within the state were calculated while dollar amounts were ~~figured~~ for each item. Further calculations were made for amounts that were imported and exported and the amount of land needed to produce 100% of Ohio's needs. It was found that 42% of the food eaten in Ohio is produced outside the state. Approximately 75% of the fresh vegetables consumed in state are produced in other states. Thus, every year approximately \$5 billion is spent on food produced outside Ohio. While amount of food imported varies by item, overall with a shift in cropping patterns and varieties Ohio has the potential to become largely self-sufficient in most of the foods it consumes. Some alarms are sounded as regards the dangers of dependence upon food sources at great distances and recommendations are made for changes which are needed in the food system to reduce dependence on out-of-state suppliers.

9:00

## GERMAN SETTLERS IN OHIO: THE INITIAL IMMIGRATION PHASE. Hubert G.H. Wilhelm, Department of Geography, Ohio University, Athens, Ohio 45701.

Immigration in Ohio during the Nineteenth Century can be divided into two time periods based on ethnicity and settlement destination. Prior to 1850, immigrants were primarily northwest European protestants who settled in rural areas. Most numerous among this group coming into Ohio were the Germans whose emigration was in response to economic hardships and political ferment at home. In contrast to the Anglo-American settlers in Ohio, the immigrants became spatially more localized and the Germans were no exception. The availability of land or work and ethnic affinity were the controlling factors in their distribution. Several areas in the state can be identified as early German settlement districts. They are primarily rural-agricultural areas in western Ohio and the "back-bone" country of northern Ohio. Family and place names, religious denominations, agricultural land use practices, and traditional architectural forms serve as cultural residuals of German settlement in Ohio.

9:15

## LANDSCAPE OF PIETY/LANDSCAPE OF PROFIT: THE AMISH-MENNONITE AND DERIVED LANDSCAPES OF NORTHEASTERN OHIO. Allen G. Noble, Department of Geography, University of Akron, Akron, Ohio 44325

In the rolling hill country of Holmes, Wayne and Tuscarawas counties of Ohio, two closely related religious groups, the Amish and the Mennonites, have evolved a cultural landscape quite distinctive from that of other rural settlers. Many of the most characteristic features of this landscape can be traced to a religious basis. This paper identifies the major components and aspects of Amish-Mennonite settlement and how they demonstrate a religious connection.

A second distinctive cultural landscape is developing in the area of Amish-Mennonite settlement. Although it depends upon those groups for its existence, the orientation and expression of this landscape are quite different, in fact, almost diametrically opposed to those of the Amish/Mennonites. This second landscape is based upon tourist expenditures and commercial exploitation. Together the landscape of piety and the landscape of profit characterize the Amish-Mennonite settlements of northeast Ohio.

- 9:30 THE RESIDENTIAL REAL ESTATE: DIFFERENTIAL IN BID AND ASK PRICES. Raj A. Padmaraj and Mohan N. Shrestha. Department of Finance, Bowling Green State University, Bowling Green, Ohio 43403.

It is generally believed that the price differential between final bid and originally asked prices of residential properties does not exceed more than about ten percent. It is stated that the potential buyers are hesitant to bid for a home at a price substantially below the asking price. However, no bidder is likely to pay the asking price even in a very active real estate market. Whether the belief that the final bid price is only slightly below the 'ask' price is borne out by empirical evidence is the subject matter of this study.

This study proposes to analyze the actual transaction data of asking and closing prices from various residential areas of Bowling Green City for good as well as bad years, 1978 to 1981. The data will be obtained from the County Recorder's office and from the local brokerage houses. The results of the study will provide some insights into the real estate market behavior in a small town.

- 9:45 AN APPROACH TO A REGIONAL DYNAMIC CLIMATOLOGY. Jerome M. Clemens, Wright State University, Dayton, Ohio 45435.

The near-surface climate cannot be divorced from the mass- and energy delivery systems of the regional "free" atmosphere. This study sets forth theory and practice for evaluating three fundamental quantitative descriptors of the regional circulation. Monthly estimates of velocity divergence, relative vorticity and vertical pressure velocity are derived from time-mean resultant winds for a region centered on Dayton, Ohio. Results are graphed and discussed. Implications for application of the procedure to daily observations are advanced.

- 10:00 THE RELEVANCE OF GEOGRAPHY IN THE TRAINING OF HEALTH PROFESSIONALS. John Hiltner and Bruce W. Smith, Department of Geography, Bowling Green State University, Bowling Green, Ohio, 43403

Although geography is generally not included in the career preparation of health professionals, the subject matter of geography, the methods of analysis utilized by geographers, and the techniques of geographic analysis are often relevant to health professionals. Furthermore, since many health professionals are unaware what geographers do, they often do poorly what we do best.

The locating of health facilities, the identification of client populations, the conducting of needs assessments, the utilization of census geography, the cartographic presentation of data, and the identification of environmental variables which affect the health of people are some of the more obvious examples of contributions geographers can make to the health sciences.

The authors have been involved in the education of health professionals in a university setting, in the continuing education of health professionals, and as consultants. The response of health professionals has been positive to us as geographers and to the contributions we have made to their education and training and the solving of their problems.

- 10:15 STRATEGY FOR OHIO INDUSTRIAL GROWTH  
Richard W. Janson  
The Janson Industries; P. O. Box 6090; Canton, OH 44706  
and Vera K. Pavlakovic  
Kent State University, Geography Department, Kent, OH 44242

## GEOGRAPHY

The structural changes occurring among Ohio industries primarily reflects changes in comparative advantage. Blast furnace production, for example, is no longer economical except in littoral locations designed for immense scale; and have therefore been phased out of Youngstown and Canton. When these trends are measured against national trends the declines in employment (jobs) are catastrophic. At the same time the fabricated metals industry, using the product of strip and bar mills has actually added employment.

An analysis is used that separates the regional effects from the national effects. Fabricated products gain bulk and have locational advantages near their markets, and are frequently small operations with highly differentiated products requiring high inputs of managerial skill per unit of output, which promotes technological innovation. Concentration on industry sectors with these attributes can power a growth trajectory based on small firms exploiting a specialized market niche that will generate the net growth in jobs for Ohio in the next decade. The conclusions represent a strategy for growth.

10:30 A GEOGRAPHICAL ANALYSIS OF WORLD REFUGEES. Thomas D. Anderson, Department of Geography, Bowling Green State University, Bowling Green, Ohio, 43403.

Recent published data related to refugees were mapped and patterns analyzed. Refugees were defined as people displaced primarily by political rather than economic causes, although consistent classification was difficult. Three map categories were employed: 1) Country of Origin, 2) Country of Asylum, 3) Country with Internal Displacement. Where appropriate the main area of turmoil within larger countries was noted. Five major regions of origin were identified (Cuba, Israel, Ethiopia, Afghanistan, and Indochina), as well as several others of lesser magnitude. Brief discussion of the apparent causes of displacement was used to link refugee flow with the affected countries of asylum. A distinction between holding camps and mainstream resettlement was part of the analysis. Also treated briefly were cultural, ideological, and geopolitical dimensions of the various streams of refugees.

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## F. GEOGRAPHY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

HANNA HALL, ROOM 205

MARY ELLEN MAZEY, PRESIDING

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### 1:30 BUSINESS MEETING

1:45 THE PATTERN OF POPULATION DISTRIBUTION IN BELIZE: 1970. Bob J. Walter. Department of Geography, Ohio University, Athens, Ohio 45701.

Belize is a small country in Central America with an extremely uneven population distribution. Generally, the higher densities occur along the coast and the major transportation lines. The empty areas are the highlands of the south, heavily forested, and the western borderlands of the north. This pattern is related both to physical elements and to the settlement history by different ethnic groups.

2:00 A CLASSIFICATION OF MARKETS. Jeffrey J. Gordon, Department of Geography, Bowling Green State University, Bowling Green, Ohio 43403.

In this paper a general classification of markets into three major forms is initially proposed. Fairs, periodic markets, and permanent markets are compared to each other according to criteria of age, temporal spacing, demand functions, participants, size, tributary area, and overall impact. A more specific market classification is then advanced subdividing fairs, periodic markets, and daily markets into levels, classes, and types according to particular economic emphases. The resultant matrix is found suitable for classifying any given market.

- 2:15 THE DEVELOPMENT OF TIDAL POWER AS AN ALTERNATE ENERGY SOURCE.  
Leonard G. Peacefull, Department of Geography, University of Akron,  
Akron, Ohio 44325.

With the need to seek alternate sources of energy, man must one day turn his full attention to the sea. Since two-thirds of the Earth's surface is covered by the sea, a vast reserve of untapped energy waits to be harnessed in some form or another.

This paper examines from a geographic viewpoint the developments that have taken place in America with the Passamaquoddy project, the French Barrage de la Rance, experiments in the United Kingdom, and other schemes elsewhere. Without going into the detailed engineering aspects, the paper also outlines some of the plans for tidal power station sites and operation. In addition, the economic viability of tidal power generation is addressed. In conclusion, the paper looks at current research on harnessing energy from the sea and makes some observations as to possible future sites.

- 3:00 A COMPUTER APPROACH TO ORGANIZATION OF A MEDIUM-SIZED MAP COLLECTION IN AN  
ACADEMIC LIBRARY  
Margaret A. Roach  
Wright State University Library  
Colonel Glenn Highway, Dayton, Ohio 45435

Abstract: A batch computer system designed to identify and locate holdings in a USGS depository map collection is in operation at the Wright State University Library. The system produces a finding list which can be updated at regular intervals by staff with limited knowledge of maps. It is adaptable to different types of maps and is easy to use by patrons and by staff. Access to maps is accomplished by geographic area with secondary access by subject. The system is inexpensive to operate.

The Mark IV program is adaptable to any medium to large scale IBM system. A six character numerical record is assigned to each entry which stores 150 characters of information in six fixed fields. The first three fields are geographical areas followed by location, date of holdings, and subject fields. The geographical fields accommodate continents, oceans, countries of the world, and extraterrestrial maps as major divisions. Minor divisions include continent, state, planet, and ocean names. A third field describes the area of the minor division. At present, the formatted holdings list records 24,000 maps occupying 3.6 million characters of storage space.

- 3:30 THE DISTRIBUTION OF THE GERMAN MINORITY IN THE SOVIET UNION. Jordan A. Hodgkins  
and Clyde I. Smith, Department of Geography, Kent State University, Kent, OH 44242.

Germans comprised the 14th largest ethnic group among the 103 groups enumerated in the 1970 Soviet census. Prior to World War II a German Autonomous Republic existed in the Volga Region. Abolished by Stalin its inhabitants were scattered. Approximately 75 percent of the German population is now located in Central Asia and adjacent regions of Western Siberia. Fifty-three percent is in Central Asia and 21 percent in West Siberia. The Ural Region has 8 percent of the German population, East Siberia 4, the North Caucasus and Volga Region 2 each and the European North 1 percent. Nearly 7 percent are unaccounted for regionally in the census. Comparisons of German population distribution for the census of 1897, 1926 and 1970 are made.

- 3:45 THE POTENTIAL FOR SUCCESS IN LATIN AMERICAN ECONOMIC INTEGRATION: THE LATIN  
AMERICAN FREE TRADE ASSOCIATION. Joseph G. Spinelli and Bruce W. Smith.  
Department of Geography, Bowling Green State University, Bowling Green,  
Ohio 43403

Following up on an earlier paper that showed a high degree of competitiveness rather than complementarity in the composition and degree of foreign trade, this paper pursues the important question of overall homogeneity among the member nations of the Latin American Free Trade Association. If social, cultural, and political indicators are subjected to a principal components analysis along with trade indicators, what potential can be ascertained for ultimate success in the integration of the economies of the countries of Iberian South America and Mexico? If the member countries are relatively homogeneous in their socio-economic and trade compositions, then future trade creation may not be forthcoming. The subject of this paper will be the determination of the degree of similarity or dissimilarity.



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G. CHEMISTRY

MORNING SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 140

R. THOMAS MYERS, PRESIDING

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- 8:30 STRUCTURAL CHANGES IN COAL FROM YANZHOU, CHINA, UPON PREHEATING TREATMENT. PART I. FOURIER TRANSFORM INFRARED SPECTROSCOPIC STUDIES. By Peng Chen, P. E. Yang, P. R. Griffiths, and James Y. Tong. Chemistry Department, Ohio University, Athens, Ohio 45701.

Preheating treatment is a very important step in coke production from high volatile bituminous coal. The structural changes due to such treatment in coal samples from Yanzhou, China were investigated using diffuse reflectance FT-IR spectroscopy on solids extracted by chloroform from untreated coal and heat-treated coal. Powdered coal samples of 200 mesh were heated under vacuum at temperatures from 250 to 400°C and quenched. The changes in chloroform extractability and the changes in various regions of the infrared spectra as a function of treatment temperature were explained in terms of decomposition and condensation reactions at these temperatures.

- 8:45 FLOCCULATION STUDIES ON CHINA CLAYS USING NATURAL GUMS AND RELATED MATERIALS. David J. Ager, Andrew C. Dollimore and David Dollimore, Department of Chemistry, The University of Toledo, Toledo, Ohio 43606

The treatment of china clay by a settlement process is a recognized method in the separation technique. The china clay can be flocculated by the use of flocculants. These are usually expensive water soluble synthetic polymers. Alternative materials, namely natural gums are demonstrated here to be effective as flocculants. The optimum conditions for clarity of the supernatant differs from that required to produce a quickly settling flocculated clay. The theories of hindered settling are developed to calculate the size of the flocs produced. It is shown that a large amount of water remains associated with these floc structures and this is included in the estimate of size.

A sequence of experiments is developed to characterize the behavior of the flocculated china clay. This sequence starts with the observance of the rate of settling of the settling interface, and a note of the final settled volume. This is followed by a determination of the clarity of the supernatant liquid and the rate of filtration through the naturally settled bed. The other determinations, i.e. the amount of liquid driven off at 120°C, the differential thermal analysis and the thermogravimetric data all refer to the manner in which the water associated with the floc structures is held.

- 9:00 INSOLUBLE POLYMERS WITH PENDANT THIOETHER AND SULFOXIDE FUNCTIONAL GROUPS. Anup Sood and Julian A. Davies, Department of Chemistry, University of Toledo, Toledo, Ohio 43606.

Insoluble polymers with pendant functional groups are useful both as reagents in organic synthesis and as supports for catalytically active metal ions. In this context, polymers with sulfur-functional groups are of interest because of environmental hazards associated with traditional S-functional reagents and the realization that metal complexes of S-donor ligands are catalytically active in several useful organic transformations. This report describes the synthesis, properties, and characterization of insoluble polystyrene resins with thioether and sulfoxide pendant functional groups. Two preparative routes have been explored: (i) Preparation and copolymerization of S-functional monomers (eg:  $p\text{-H}_2\text{C:CHC}_6\text{H}_4\text{SC}_2\text{H}_5$ ) and (ii) surface modification of preformed polystyrene via chloromethylation and subsequent functionalization (eg: with  $\text{NaSC}_2\text{H}_5$ ). Oxidation of the polymeric thioethers yields the corresponding sulfoxides. The characterization of the polymers by IR, NMR, TGA and elemental analyses will be described and preliminary results of some reaction chemistry of the functional polymers discussed.

9:30 ABSORPTION AND ADSORPTION OF  $Zn^{2+}$  FROM WATER BY BLUEGILL FISH

Theodore C. Thepe, S.J., Quentin Pickering, Patrick J. McCullough, Raymond L. Noschang, John P. Schwegmann, Steven A. Stiens, John C. Westerbeck, Edward A. Herbers, Michael A. Nowak, Robert B. Richter, Carol L. Steltenkamp, Scott Woods, Xavier University, Cincinnati, Ohio 45207

Experimental and control groups of equal biomass of fish were selected. Experimental fish were exposed to  $Zn^{2+}$  ion ( $ZnSO_4$ ) with a maximum concentration of 2.3 ppm for a period of 42 days. A depuration period of 42 days followed in which no zinc was administered to the experimental fish. A flow-through system was set up by which recipe water (40-48 ppm of hardness) was continuously pumped through the tanks. Fish samples were taken three times a week, sacrificed, frozen and freeze dried before activation. Fish organs chosen for zinc content were eyes, operculum, gills, heart, brain, liver, skin and muscle. Water samples were simultaneously taken, acidified and refrigerated in accordance with EPA guidelines. Neutron activation was employed to analyze the zinc content of the tissues. Water was analyzed for pH, temperature, dissolved oxygen and aqueous zinc content. A computer program was written to analyze the neutron activation data.

## 9:45 EFFECTS OF SIZE OF ATOMS ON CHEMICAL PROPERTIES. R. Thomas Myers, Dept. of Chemistry, Kent State University, Kent, OH 44242

$Cu^{2+}$  is stable in aqueous solution,  $Ag^{2+}$  is unstable. Boron hydride is  $B_2H_6$ , the aluminum compound is polymeric,  $(AlH_3)_x$ .  $BMe_3$  is a monomer; the aluminum compound, like  $B_2H_6$ , is a dimer:  $Al_2Me_6$ .  $BF_3$  and  $SiF_4$  are gases,  $AlF_3$  and  $SnF_4$  are high-melting solids. The basic reason for these differences is a difference in size of atoms.

## 10:00 EXPERIMENTAL DETERMINATION OF THE HEAT OF VAPORIZATION David Dingley, SUNY Fredonia, NY 14063

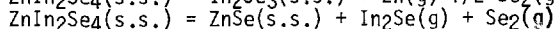
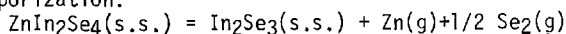
The heat of vaporization of a liquid may be determined by a relatively simple laboratory experiment. Values for heat of vaporization of water obtained by students in the experiment agree with tabulated values. Calculations are made with a form of the Clausius-Clapeyron equation.

## 10:15 VAPORISATION OF INDIUM-TELLURIUM COMPOUNDS. R.Srinivasa, J.G.Edwards; Department of Chemistry, University of Toledo, Toledo, OH 43606.

Lack of consistency in the literature data on the vaporisation of  $In_2Te_3$  and the absence of pressure-composition phase diagrams led us to take up a detailed investigation. The chemistry and thermodynamics of vaporisation of several solid compounds in this system determined by mass spectrometric and simultaneous Knudsen-torsion-effusion methods in the temperature range 600-900 K will be described. The vaporisation reactions will be reported along with the thermodynamic parameters. A pressure-composition diagram proposed on the basis of the results will be presented. The importance of the Pb-In-Te system in solid-state science led us to undertake a chemical vaporisation study of this system by the same methods. Vaporisation reactions and their thermodynamics will be presented.

10:45 VAPORIZATION CHEMISTRY AND THERMODYNAMICS OF  $ZnIn_2Se_4(s)$  A. Qusti and J. G. Edwards, Department of Chemistry, University of Toledo, Toledo, OH 43606

The phase relationships, vaporization, and thermodynamics of  $ZnIn_2Se_4(s)$  were investigated with the simultaneous torsion-Knudsen effusion method in the temperature range 1030-1217 K. The plot of  $\log p$  vs  $1/T$  showed a continuous decrease of pressure with time, in line with the fact that extensive solid solution of  $ZnSe$  and  $In_2Se_3$  in  $ZnIn_2Se_4$  was found in our phase studies. Literature reports show that  $ZnSe(s)$  is about nine times more volatile than  $In_2Se_3(s)$ . At a given temperature the pressure above  $ZnIn_2Se_4(s)$  at the beginning of our experiments was three times the pressure at the end. The following equations represent the vaporization:



where the first reaction suppresses the second.  $\Delta H^\circ(298K)$  calculated by the 3rd and 2nd law methods on the basis of the first reaction were  $401.7 \pm 0.6$  and  $395.7 \pm 13.6$  kJ mol<sup>-1</sup>, respectively. High-temperature mass- spectrometric investigations of the vapor species above  $ZnIn_2Se_4(s.s.)$  will be reported.

## G. CHEMISTRY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

OVERMAN HALL, ROOM 140

R. THOMAS MYERS, PRESIDING

## 1:30 BUSINESS MEETING

## 1:45 EQUILIBRIUM THERMODYNAMICS IN THE SUBLIMATION OF VS(S)

Jimmie G. Edwards, Department of Chemistry, University of Toledo, Toledo, OH 43606

The sublimation of VS(s) was studied in the range 1740-2098 K by the simultaneous Knudsen-torsion effusion method. Vapor pressures of two independently prepared samples were measured in two separate experiments. Each experiment included Knudsen- and torsion-effusion measurements, and thus four sets of vapor pressures as functions of temperature were obtained. The vapor pressure of VS(s) was best represented by  $\log (P/\text{Pa}) = -(2.158 \pm 0.057)K/T + -11.00 \pm 0.29$ . The vapor was assumed to be composed of the species VS(g), VS<sub>2</sub>(g), V(g), S<sub>2</sub>(g), and S(g). The partial pressures were calculated with the following information: The equilibrium S<sub>2</sub>(g) = 2S(g) is well understood. Other investigators have shown that VS(s) vaporizes congruently and that the partial pressure of VS<sub>2</sub>(g) is ca. 10% that of VS(g). The partial pressure of V(g) could not exceed the vapor pressure of V(s); the partial pressure of V(g) was equated to the vapor pressure of V(s), and thus the results were limiting values. For the reaction VS(s) = VS(g), selected  $\Delta H^\circ(298 \text{ K}) = 553 \pm 9 \text{ kJ/mol}$ . For the reaction VS(s) = V(g) + S(g), selected  $\Delta H^\circ(298 \text{ K}) = 1037 \pm 7 \text{ kJ/mol}$ . Then for the dissociation VS(g) = V(g) + S(g), selected  $\Delta H^\circ(298 \text{ K}) = 484 \pm 9 \text{ kJ/mol}$ . The latter value is reasonably comparable with the literature value,  $449.4 \pm 14.6 \text{ kJ/mol}$ , obtained by a mass-spectrometric, isomolecular-exchange reaction with GeS(g). The limiting assumption was accurate, the partial pressure of V(g) was near the maximum possible, thus vaporization of VS(s) in the range of 1740-2098 K is close to being incongruent.

2:00 HIGH TEMPERATURE VAPORIZATION OF THE ZnSe-Ga<sub>2</sub>Se<sub>3</sub> SYSTEM

L. Grimes and J. G. Edwards, Dept. of Chemistry, University of Toledo, OH 43606

Potential use of ZnGa<sub>2</sub>Se<sub>4</sub>(s) in solid state devices has aroused interest in the high temperature thermodynamics of this compound. X-ray powder diffraction analysis of samples prepared at 10 mole% intervals in the ZnSe-Ga<sub>2</sub>Se<sub>3</sub> system revealed the existence of only the ternary compound, ZnGa<sub>2</sub>Se<sub>4</sub>. Vapor pressures were obtained from the vaporization of ZnGa<sub>2</sub>Se<sub>4</sub> from a graphite cell in the range 1071-1194 K by the torsion-Knudsen effusion method. On the log P vs 1/T plot the data fell into two distinct sets. The initial data were inconsistent; vapor pressures decreased with time. The later data were consistent with a least-squares line and showed no trend with time. The transition between the two sets occurred at the stoichiometry of Ga<sub>2</sub>Se<sub>3</sub>. The vaporization of ZnGa<sub>2</sub>Se<sub>4</sub>(s) was represented by

$$\begin{aligned} (1) \quad & \text{ZnGa}_2\text{Se}_4(\text{s}) = \text{Ga}_2\text{Se}_3(\text{s}) + \text{Zn}(\text{g}) + 1/2 \text{Se}_2(\text{g}), \text{ and} \\ (2) \quad & \text{Ga}_2\text{Se}_3(\text{s}) = \text{Ga}_2\text{Se}(\text{g}) + \text{Se}_2(\text{g}). \end{aligned}$$

The  $\Delta H_{298}^\circ(\text{vap})$  of reaction (1) was  $367.0 \pm 0.6 \text{ kJ/mol}$ . The apparent molecular weight of the vapor was  $96.1 \pm 2.6$ ; the molecular weight of ZnSe vapor is 100.9. The  $\Delta H_{298}^\circ(\text{vap})$  of reaction (2) was  $598.4 \pm 0.3 \text{ kJ/mol}$ . The apparent molecular weight was  $143.1 \pm 3.6$  which is below the expected value of 189.4 for Ga<sub>2</sub>Se<sub>3</sub> vapor. High temperature mass spectrometric investigations of the vapor species produced by ZnGa<sub>2</sub>Se<sub>4</sub>(s) were consistent with the results above. Relative peak intensities of major ionic species before the transition were Se<sup>+</sup>(100), Zn<sup>+</sup>(42), Se<sup>+</sup>(31), Ga<sup>+</sup>(13), and Ga<sub>2</sub>Se<sup>+</sup>(10), and after the transition Se<sub>2</sub><sup>+</sup>(100), Ga<sup>+</sup>(70), Se<sup>+</sup>(67), and Ga<sub>2</sub>Se<sup>+</sup>(23).

## 2:30 VAPORIZATION CHEMISTRY AND THERMODYNAMICS OF THE MANGANESE-INDIUM-SULFUR SYSTEM

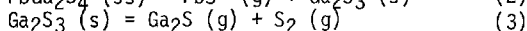
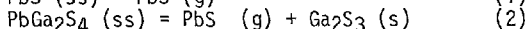
J. Botor and J. G. Edwards, Dept. of Chemistry, University of Toledo, OH 43606

The MnS-In<sub>2</sub>S<sub>3</sub> solid system was investigated in the temperature range of 1034-1229 K by measurements of vapor pressures with a simultaneous Knudsen-effusion (KE) and torsion-effusion (TE) technique. This study was the first investigation of vaporization chemistry and thermodynamics of the Mn-In-S system. The vaporization reaction was  $\text{MnIn}_2\text{S}_4(\text{s}) = \text{MnS}(\text{s}) + \text{In}_2\text{S}_3(\text{g}) + \text{S}_2(\text{g})$ . Least-squares straight lines relating the equilibrium constants to the temperature were: for region I (In<sub>2</sub>S<sub>3</sub>-MnIn<sub>2</sub>S<sub>4</sub>) [ $\log (K_p/\text{Pa}^2) = -(28836 \pm 325) K/T + 24.94 \pm 0.29$ ] from TE results, and [ $\log (K_p/\text{Pa}^2) = -(28817 \pm 450) K/T + 24.84 \pm 0.40$ ] from KE results. For region II (MnIn<sub>2</sub>S<sub>4</sub>-MnS) [ $\log (K_p/\text{Pa}^2) = (34905 \pm 423) K/T + 29.62 \pm 0.36$ ] and [ $\log (K_p/\text{Pa}^2) = -(34712 \pm 475) K/T + 29.37 \pm 0.41$ ], respectively. Third-law analyses

gave standard enthalpies at 298 K of the vaporization reactions  $631.3 \pm 0.3$  from TE results and  $633.2 \pm 0.4$  kJ/mol from KE results for region I, and  $644.4 \pm 0.4$  and  $646.2 \pm 0.4$  kJ/mol for region II, respectively. Literature values of enthalpies of vaporization of pure  $\text{In}_2\text{S}_3$  are from  $602 \pm 13$  to  $617 \pm 13$  kJ/mol. This difference we can explain by decreasing pressure  $\text{In}_2\text{S}_3$  concentration in the solid solution. The average molecular weight of  $\text{In}_2\text{S}_3$  vapor is 181.5. A vapor analysis from the combined Knudsen and torsion effusion results gave an apparent molecular weight of the effusion vapor of  $156.4 \pm 3.6$  for region I and  $152.5 \pm 3.1$  for region II. The difference will be discussed.

3:00 VAPORIZATION CHEMISTRY IN THE LEAD SULFIDE-GALLIUM SULFIDE SYSTEM  
M. Williamson and J. G. Edwards, Dept. of Chemistry, University  
of Toledo, Toledo, OH 43606

Increasing interest in ternary metal chalcogenides, because of their useful solid-state properties, has led to this study of the lead sulfide-gallium sulfide system. Samples varying in increments of 10 mole percent PbS were prepared from the elements by heating in evacuated and sealed Vycor tubes. Debye-Scherrer X-ray patterns were taken to enable analysis of each sample. One ternary compound,  $\text{PbGa}_2\text{S}_4$ , was found. Vaporization chemistry in the  $\text{PbS-Ga}_2\text{S}_3$  system was studied by simultaneous Knudsen-effusion and torsion-effusion measurements in the range 900-1200K. On a plot  $\log P$  vs  $1/T$  the data fell into three regions. Two regions exhibit the presence of solid solutions which require invocation of solution laws to obtain thermodynamic data. In the third region the vapor pressure was independent of sample composition. Proposed vaporization reactions are;



The second and third law  $\Delta H^\circ(298)$  for reaction (3) are  $725.0 \pm 17.7$  kJ/mole and  $680.9 \pm 0.4$  kJ/mole, respectively. Thermodynamic properties and solution laws of the solid solution regions will also be presented. High-temperature mass-spectrometric investigation in the  $\text{PbS-Ga}_2\text{S}_3$  system will be reported.

3:30 WHICH ARE STRONGER, SIGMA OR PI BONDS? R. Thomas Myers, Dept. of Chemistry,  
Kent State University, Kent, OH 44242.

Most books state that sigma bonds are stronger than pi bonds, but use limited evidence. Use of a large number of compounds shows that the relative strength varies, but pi bonds are more often stronger than sigma bonds. The strength of the pi bonds generally increases as the electronegativity difference between atoms increases. There is a common error in discussing overlap of orbitals in bonds, and its relation to strength.

3:45 THE PH OF NATURAL WATERS IN EASTERN UNITED STATES. Bruce V. Weidner, 308 University  
Avenue, Oxford, Ohio 45056.

The pH of Natural Waters in the State of Ohio and other states east of Ohio will be presented. The acid rain apparently is more or less neutralized by the earth and other materials that are discharged into these waters. No waters were found except in mining areas with a pH lower than equilibrium water.

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## H. SCIENCE EDUCATION

FIRST MORNING SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 116

ED CORLEY, PRESIDING

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8:30 CONTROVERSIAL ISSUES IN SCIENCE TEACHING  
A set of three presentations as follows:

1. TEACHING OF EVOLUTION AND/OR CREATION: SOME PRACTICAL STRATEGIES  
Mr. Gary Courts, Miamisburg High School, Miamisburg, Ohio 45342
2. ISSUES AND PRACTICAL STRATEGIES FOR TEACHING SEX EDUCATION IN SCHOOLS  
Mrs. Carol M. Jones, Science and Environmental Education Center,  
College of Education, University of Cincinnati, Cincinnati, Ohio 45221
3. USE OF LIVE ANIMALS: INHUMANE OR RESPONSIBLE  
Dr. Piyush Swami, Assistant Professor, Science and Environmental  
Education Center, College of Education, University of Cincinnati,  
Cincinnati, Ohio 45221

Each presentation will include a discussion of the legal and educational considerations surrounding the three specific controversial issues. Some practical strategies will be presented that might be helpful for elementary and secondary school teachers in dealing with these issues in their curriculum. A brief discussion period will be allowed for participants to express their reactions.

9:15 ADDRESSING ETHICAL ISSUES IN THE SCIENCE CLASSROOM: A MODEL. Deborah L. Bainer  
The Ohio State University, School of Natural Resources, 2021 Coffey Road,  
Columbus, OH 43210

Moral issues are implicit when science and society interface. Science education cannot help but acknowledge these ethical issues in preparing students to be responsible decision makers. How these ethical issues can be addressed within the legal and scientific bounds of the classroom is open to question. Kohlberg's cognitive development theory explains the sequential development of the sociomoral decision making ability in students. The theory attributes progression through a series of increasingly humanistic stages to the discussion of dilemmas containing conflicting ethical issues. However, an instructional strategy useful to classroom teachers is not defined by Kohlberg's theory. Walker's model from developmental psychology suggests a promising methodological approach for presenting ethical issues in science. The model addresses three mental areas: cognitive learning, perspective-taking, and moral judgment. Walker's model suggests an effective sequence in which to present material, reinforces science methodology, and stimulates sociomoral development in students.

9:45 OBJECTIVITY IN SCIENCE: A CASE STUDY IN ACID RAIN RESEARCH. Thomas A. Franz,  
Slayter Hall Box # 977, Denison University, Granville, Ohio 43023

This paper explores the types of value judgments made in scientific work and the influence of the scientific community and society on those judgments. We undertake a two part analysis: the first is an examination of various philosophical and sociological models of science, e.g., those laid out by Thomas Kuhn in The Structure of Scientific Revolutions, and Warren O. Hagstrom in The Scientific Community. The second deals with the acid rain controversy, and uses the current debate in the literature between K.A.Rahn, et. al., and others (Science, 11 June 1982, p. 1172) to investigate how the scientific community resolves conflicts in value judgments. Since value judgments are seen to be an integral part of science, but are also culture bound and subjective, must we consider science to be subjective as well? The paper concludes by examining what the bases for claims of objectivity might be, and what impact such claims could have or have had on our science.

10:00 COMPUTER LITERACY FOR THE SECONDARY SCIENCE TEACHER.  
Dr. Joy S. Lindbeck The University of Akron, Akron, Ohio 44325

Undergraduate and graduate courses have been developed to provide instruction in the evaluation of software and in the BASIC language to permit the writing of programs. A vocabulary development program for cell components was written in BASIC for the Apple II as an example of instructional strategies and programming techniques appropriate for the secondary science classroom.

10:15 FINAL REPORT ON THE COMPUTER-ASSISTED INSTRUCTION PROJECT IN 9TH GRADE SCIENCE AT NATIONAL TRAIL HIGH SCHOOL. Ed Corley, National Trail H.S., RR# 2, New Paris, Ohio 45347.

The project design and some sample programs were presented at the last Annual Meeting. A brief synopsis will be given at the beginning of the session. The emphasis of this presentation will be the results obtained.

In this study of the effectiveness of computer-assisted instruction on the performance of 9th grade Science students it was found that in the 3 areas where computer programs were developed Experimental group (computer-using) students showed gains of 16.5%, 9.8%, and 7%, respectively, above the gains shown by the Control group (non-computer-using) students. When an overall average was calculated General Science students showed a difference between the Control and Experimental students of -.43% (Experimental students were lower). The same comparison for Life Science students showed the Experimental group to average .57% higher than the Control group. The great difference between the Control and Experimental groups for the three items for which computer programs were available is seen as evidence to support the continued use of the computer in my science program. All data will be available to interested parties for their inspection.

Funding for this project came through a grant (#C-3-81) from the Martha Holden Jennings Foundation of Cleveland, Ohio.

10:30 THE USE OF A COMPUTER SIMULATION POPULATION PROGRAM IN THE HIGH SCHOOL BIOLOGY CLASSROOM. Lois Daniel, Princeton High School, 11080 Chester Road, Cincinnati Ohio 45246.

A computer program, Mouse Population, was developed for use with average ability high school biology students. The program was written so that the students could assume the role of investigators, sampling a computer simulated mouse population to determine the estimated population size and density. It emphasizes student input and reinforces learning by graphically representing the traps and mice. The computer acts only as a simulator, leaving the calculations and the interpretation of the data to the student.

The computer aided instruction was popular with the students as a class lesson during the study of a population unit. The lack of previous experience with microcomputers was no handicap and students were able to collect data and complete calculations in one period.

The use of the computer simulation is compared with a mealworm population lab investigation in which the students actually do the sampling as well as collecting the data and making the calculations.

10:45 CAREER GUIDANCE IN MATH AND SCIENCE AT NATIONAL TRAIL HIGH SCHOOL. Ed Corley, National Trail HS, RR# 2, New Paris, Ohio 45347.

Ninth grade General Science and Life Science students at National Trail are exposed to various Science and Math-related career opportunities through a combination of various instructional and informational media as well as through field-trips to pertinent sites. This session will describe some of the materials used for in-class career guidance activities as well as a discussion of field-trip sites. Materials and sites should prove applicable to teachers in other school systems. Funding for some materials has been made possible through minigrants from the Preble County Career Guidance program.

Classroom activities currently being used at National Trail include the use of computer program simulations, a career guidance computer program/slide presentation on Science and Math-related careers, COMETS (Career Oriented Modules to Explore Topics in Science) activities developed at the University of Kansas, and a Computer Club through which field-trip activities are conducted. Field-trip sites include Sinclair Community College in Dayton, Wright State University, Wright-Patterson Air Force Base Engineering Lab, NCR Corporation, and The Harris Corporation. Students are exposed to careers in data processing and high technology applications through these field-trip visits and also have received valuable advice from people in those fields presently.

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## H. SCIENCE EDUCATION

SECOND MORNING SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 115

SPENCER REAMS, PRESIDING

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- 8:30 FORMATION OF A COALITION OF ORGANIZATIONS WITH CONCERNS ABOUT THE PRESENT CRISIS.  
Darrel W. Fyffe, Executive Secretary, School Science and Mathematics Association,  
126 Life Science Building, Bowling Green State University, Bowling Green, OH 43403.

Associations of science professionals have begun meeting to address concerns posed by the developing crisis in science, mathematics, and technology education. The AAAS convened a session on May 13-14, 1982, in Washington, D.C. Seventy organizations were represented and showed interest in coalition to seek information about and solutions for the crisis. The education officer of each society was urged to give special attention to concerns relating to the conduct of education of children in the sciences, including mathematics and technology education.

At a meeting on October 18, 1982, representatives considered the direction and charge of the coalition. A synopsis of the earlier meeting delineated the aims, priorities, and information needs expressed by the speakers and discussion groups. Four major aims suggested that the societies must help:

- A. upgrade the competence and status of mathematics and science teachers.
- B. improve the science and mathematics experiences of students.
- C. increase public literacy in mathematics, science, and technology.
- D. inform the political system as it formulates policies and affects education.

This session will explain the working of the coalition, means of disseminating information, and the relationship of the member associations.

- 8:45 SHORTAGES: SCIENCE EDUCATION AND EDUCATORS  
Cynthia L. Hayes  
Science and Environmental Center  
University of Cincinnati  
608 Teachers College  
Cincinnati, Ohio 45221

Two major problems concerning science education are lack of science teaching in the elementary schools and the expected shortage of secondary science educators in the near future. The causes, effects, and solutions of each area will be discussed in the presentation.

- 9:15 NEGLECTED ASPECTS OF SCIENCE EDUCATION IN THE UNIVERSITY CURRICULUM  
Don C. Steinker. Department of Geology, Bowling Green State University,  
Bowling Green, Ohio 43403.

Many entering graduate students in geology lack an adequate knowledge of scientific methodology, research methods, and writing skills necessary for thesis work. Discussions of the nature and methodology of science generally are neglected in geology textbooks and may not be stressed in courses. Likewise, the historical and intellectual foundations of the science often are neglected in order that details of the subject matter can be treated more extensively. Commonly by the time a student finishes his undergraduate education, he has taken freshman English courses and perhaps has written a few term papers, but it may be that many examinations have required nothing more than the checking off of appropriate answers. As a result, many graduate students are ill-prepared to undertake thesis work. As a partial remedy, it is suggested that science departments consider initiating a course at either the undergraduate or graduate level that integrates aspects of scientific methodology, appropriate research methods, and the writing and construction of scientific papers.

- 9:30 A CLINICAL PROFESSORSHIP, Richard D. Hansgen, Denison Univ., Granville, OH 43023

It is uncommon for professors of education to return to an elementary or secondary school and teach one or more classes for at least a semester. Because of this, a lack of credibility exists many times between the professors and their students. We believe that a teacher of teachers should have recent experience teaching school.

This is especially true for anyone teaching methodology courses.

My colleague and I decided that it was important for us to regain the experience of teaching school. We would try to find a school that would permit us to teach one of its classes. A formal arrangement was drawn up that included the responsibilities and the benefits that would accrue to the members of the Department of Education, the University, and the participating school district.

My academic background is in physics. Because of the demand for physics teachers, I had no problem in locating a local high school that was looking for a teacher to teach its one senior class of physics. I thought my days as a physics teacher were over. Thus, I was forced into rethinking, reorganizing, and revitalizing the entire teaching sequence.

During the fall, I had student teachers strategically placed in the same district. We worked closely together. In the spring, I used my physics class as a demonstration class for a methods course I was teaching on campus. Throughout the year I was able to share with my education students many of the experiences I was encountering with my physics students. The administration of the school and Denison's Physics Department were most supportive throughout this endeavor.

#### 10:00 THE SUMMER SCHOOL OF BIOLOGY AT THE PEABODY ACADEMY OF SCIENCE (1876-1881).

Ralph W. Dexter, Department of Biological Sciences, Kent State University, Kent, Ohio 44242

Following Louis Agassiz's summer school on Penikese Island (1873-74), one of his former students and a teacher at Penikese, A.S. Packard, Jr. organized a similar one at the Peabody Academy of Science, Salem, Mass. It was primarily for science teachers to learn biology by actual experience with living plants and animals. A wooden lab building 20 x 30 ft. was constructed behind the museum. Teachers included Packard (insects), E.S. Morse (mollusks), J.H. Emerton (spiders), J.S. Kingsley (crustaceans), John Robinson and J.H. Sears (botany), Caleb Cooke (marine dredging), and E.C. Bolles (microscopy). Season of 1878 stressed study of marine life with a second lab located on Salem Neck. Morse was director the last two years. This became one of the pioneers in development of biological field stations.

#### 10:15 DREYFUS INSTITUTE FOR IMPROVING THE TEACHING OF HIGH SCHOOL CHEMISTRY.

Dr. Clifford L. Schrader

The materials developed at the Dreyfus Institute in 1982 at Princeton University will be provided and discussed. The purpose of the Dreyfus program was to develop demonstrations, laboratory experiments and concomitant materials which could be used by high school teachers to improve their chemistry course. The philosophy, background, antecedent concepts, and follow-up exercises for the program will be explained. The theme of electrons in motion will be related to reaction kinetics, electro-chemistry, and the model of tangent spheres.

Free copies of the materials developed will be provided. Some demonstrations will be shown and several laboratory exercises will be discussed in detail.

#### 10:45 CONTINUING EDUCATION IN THE TECHNICAL ARENA, Mary K. Linde, Ph.D., Department of Health Sciences, Muskingum Area Technical College, 1555 Newark Road, Zanesville, Ohio, 43701

The technical revolution and increased demand for competent technicians has promoted marked changes in the need for continuing education at the technical level. Criteria of technical competency is continuously and extremely rapidly changing. The technician must maintain a current knowledge of new developments in his/her field and acquire new skills to adapt to these changes.

The technical college serves an important role in continued technical development. Attributes of the technical which mandate this role include its ability to provide a competent technical staff, local availability, and up-to-date technical equipment. Such assets provide continuing education which assures competency and which is financially attractive to the technical worker and his employer.

Models of structural design and paradigms for development of continuing technical education programs are presented. Design, implementation, and evaluation of instructional media will be discussed. The effectiveness of various media is analyzed according to cognitive learning psychology. Tools for needs assessment, learner analysis, and evaluation are presented.



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## H. SCIENCE EDUCATION

THIRD MORNING SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 117

PHILIP R. CHATWOOD, PRESIDING

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8:30 MAINSTREAMING THE PHYSICAL HANDICAPPED IN THE SECONDARY SCIENCES  
Dr. Evan McFee Bowling Green State University, Bowling Green,  
Ohio 43403

Recently there has been a growing awareness about the potential contributions of the physical handicapped in the sciences. The sciences were often considered courses of study that were inappropriate for disabled students. However, handicapped students have now been "mainstreamed" into regular classrooms to receive the same science instruction as the regular students. Many teachers believe it will take a lot of special training and equipment to work with the handicapped in the science laboratory, but it is not as difficult or expensive as they might assume. There are many ways and adaptations which can be made to help these students fulfill their intellectual potential and work in the field of science. These ideas and suggestions will be discussed during this presentation.

8:45 SPECIAL EDUCATION SCIENCE SEMINAR AN ALTERNATIVE APPROACH TO SCIENCE INSTRUCTION FOR EDUCATIONALLY HANDICAPPED STUDENTS. Phillip R. Chatwood, 6904 Jaysville-St. Johns Road, Greenville, Ohio 45331.

This paper describes an interdisciplinary instructional program developed under a grant from the U.S. Department of Education and the Ohio Department of Education which was designed to meet the needs of the educationally handicapped student in science class. The Special Education Science Seminar Approach was developed to overcome the critical problems facing Educationally Handicapped students (Developmentally Handicapped and Learning Disabled) in science instruction. According to surveys of special education and science teachers the three major problems identified were the inability to successfully deal with the broad scope of scientific conceptualizations, the recognition and application of the deductive logic process of the scientific method, and the inability to effectively express their ideas using Language Arts skills. This project attempted to address each of these problems. Preliminary results are encouraging and will be summarized.

9:00 THE ORGANIZATION AND GUIDE TRAINING OF A VOLUNTEER MANAGED OUTDOOR EDUCATION PROGRAM Marilyn Critt and Caroline Putnam 100 Alden Avenue Marietta, OH 45750

An Outdoor Education Program, run by volunteers in the Marietta, Ohio, Public School System, has been active for the past seven years. This program has been quite successful in encouraging elementary school children to become interested in science. In this respect it could serve as a model for other school systems. The program operates on forty acres of land made available for outdoor education through the cooperative efforts of the Washington County school systems, the Washington County Soil Conservationist, and interested parents. Emphasis is placed on the formation and training of the volunteer guide group. The paper contains descriptions of free non-credit courses given to guides by Marietta College Botany and Geology professors. Through support of the Marietta Schools, guides also qualified for a National Science Foundation-sponsored Environmental Education course. Also included are descriptions of program operation and areas of science covered. Contributions to the program by members of the area scientific community are listed.

9:30 SUNDIALS AS AN AID TO UNDERSTANDING SOLAR ENERGY, Jakubowski, Gerald S., University of Toledo; Dept. of Mechanical Engineering; Toledo, Ohio 43606

Calculating the amount of solar radiation on a surface normal to the sun's rays depends on the time of year, the time of day and the latitude of the surface as well as the atmospheric conditions. Understanding the operation of a sundial can be used as a first step in understanding the complicated solar angles that are involved in solar energy calculations.

The operation and construction of a sundial requires a knowledge of astronomy, geography, trigonometry and the different methods of time-keeping. Most important is knowing the differences between the apparent solar day and the actual solar day and knowing how to incorporate these differences into the design of the sundial. These differences stem from the fact that the earth's rotational speed is not constant, i.e., during some parts of the year the earth's

rate of rotation is less than 24 hours per day and in other parts of the year it is greater than 24 hours per day. Telling time with a sundial is further complicated by the use of standard time meridians. Therefore, in order to make a sundial tell "watch time" corrections need to be made for mean solar time and standard time.

The design of sundials can be fun and challenging to students of all ages and can help in understanding the basics of solar energy.

9:45 ELEMENTARY SCIENCE ENRICHMENT STRATEGIES IN A SMALL CONSOLIDATED SCHOOL.  
Nancy S. Bakaitis, Findlay College, 1000 N. Main Street, Findlay, Ohio 45840

Science enrichment in a small school presents obvious challenges and unique opportunities for cooperative approaches to overcoming shortages in facilities, equipment and supplies; and the lack of trained personnel in elementary science.

Using an integrated program built on the skills and resources of the entire school system, many of these deficiencies can be eliminated. Teachers and administrators need to explore non-traditional ways of sharing the resources available within the entire school rather than viewing the elementary, middle, and secondary science programs as separate and isolated units.

This report presents some of the techniques developed to enhance the elementary science program of a consolidated school in northwestern Ohio, and some suggestions for strategies which could be utilized to develop an integrated and functional program based on the input of the elementary and secondary teachers and administrators.

10:00 EVALUATION OF A NONFORMAL MUSEUM PROGRAM FOR ADULT ENVIRONMENTAL EDUCATION.  
Rosanne W. Fortner, The Ohio State University, 383 Kottman Hall, 2021 Coffey Road, Columbus, Ohio 43210.

As a learning environment a museum has a great deal more freedom than many traditional educational institutions. Is the nonformal setting conducive to knowledge acquisition on environmental topics? Can a museum program affect attitudes about environmental issues?

Ohio Sea Grant supported the development of a program entitled "The Great Lake Erie Treasure Hunt" at Columbus' Center of Science and Industry (COSI) in the summer of 1982. The program included six major demonstration programs, many hands-on exhibits, traveling displays from other museums, and modification of existing exhibits to fit the theme. The program was evaluated for its impact on knowledge gains and attitude change, its visibility and people's information sources regarding the program.

Surveys of randomly selected adult visitors entering and leaving COSI indicated that while 78% were unaware of the program when they arrived, 98% of those leaving had visited the Lake Erie exhibits. On tests of knowledge about Lake resources, the mean entry score was 29% correct (N=57), compared to 51% correct on the exit survey (N=55). Visitors were also asked to indicate their attitudes about the importance of Lake Erie to Ohio and the nation. Eighty percent of entering visitors and 92% of exiting visitors held positive attitudes. The nonformal educational experiences of "The Great Lake Erie Treasure Hunt" thus appear to have been effective in improving attitudes and providing information about lake resources for the public.

10:30 GEOLOGICAL EDUCATION FOR THE WATERWELL INDUSTRY

Kenton E. Strickland  
Wright State University  
Western Ohio Branch Campus  
Celina, Ohio 45822

Ohio has enviable subsurface control owing to cooperation of water well drillers in filing logs of completed wells with the Department of Natural Resources. Formal training, however, for drillers has not been readily available. Thus, geologic materials are often incorrectly identified, and names are applied inconsistently. Drillers generally lack understanding of the geologic occurrence of ground water. As the complexity of drilling is for specialty wells, education becomes necessary.

In order to upgrade the profession, the Geological Sciences Department of Wright State University in cooperation with the National Water Well Association is attempting programs to provide a working scientific background for personnel in the water industry. This paper will explain the curriculum of the programs, give profiles of the students enrolled, and present evaluations from students who have completed the program.

## SCIENCE EDUCATION

10:45 A PROPOSAL FOR REVISION OF THE CURRICULUM OF PRESERVICE PHYSICS TEACHERS Myra R. West, Kent State University Stark Campus, 6000 Frank Avenue NW, Canton, Ohio 44720

Among the contributing factors of the crisis in science education are the difficulties not only in retaining competent teachers but also in attracting capable persons into the field. These issues are addressed by the Ohio Board of Regents and the State Board of Education in the 1981 report of the Advisory Commission on Articulation Between Secondary Education and Ohio Colleges. The Commission recommends that "teacher certification requirements should reflect a greater emphasis on major subject matter content areas."

Certification requirements in Ohio for specific science teaching areas is 20 semester hours in that science. The easiest way to satisfy the recommendation is to require additional coursework at the upper division level. Based upon the proposal for the ideal preservice physics teachers' program made by the Commission on College Physics and recommendations made by McDermott, this author doesn't believe that taking advance courses necessarily will improve high school physics instruction.

Preservice physics teachers need to understand the fundamental concepts of physics as well as to examine the origins of knowledge of physics. These are not topics covered in advance courses but rather are covered in lower division courses which are conceptual rather than mathematical in approach. Thus this author proposes that the curriculum of the preservice physics be altered to include physics courses presently listed in the University catalog such as "Seven Ideas That Shook the Universe," "Energy and the Environment," "Forensic Physics," and "Physics in Entertainment and Art."

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## H. SCIENCE EDUCATION

### FOURTH MORNING SESSION

BUSINESS ADMINISTRATION BUILDING, ROOM 104

### SYMPOSIUM

#### "SCIENCES AND MATHEMATICS PROGRAMS"

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9:00 IMPROVING MATHEMATICS INSTRUCTION IN OHIO ELEMENTARY AND SECONDARY SCHOOLS

Margaret Kasten, Ohio Department of Education, 65 South Front Street Room 1005, Columbus, Ohio 43215

Some data exist about the instruction in the mathematics classrooms in Ohio and nationally. Additionally, national and state assessments give some indication regarding the status of the mathematic literacy of our young people. There are some strengths--notably whole number computation and several disturbing weaknesses--notably problem solving and mathematical applications.

Our goals must include more than the imparting of survival skills. In order to live meaningful and productive lives students must be able to "use" mathematics to make decisions, to solve problems and to correctly interpret life situations involving mathematics.

Problem solving must be broadly defined and encompass more than word problems. A problem-solving attitude of curiosity and exploration must be fostered. Problem solving, and all that that term implies must be the focus of school mathematics for the coming decade.

In addition, the mathematics curricula must reflect an expanded definition of basic skills, incorporating much more than computation. Calculators and computers must be part of school mathematics. Mathematics curriculum development must be viewed as a dynamic process where curriculum should constantly be changing to reflect the continually changing needs of students and society. Likewise, methods of instruction must be those which best teach the changing curriculum.

10:00 CONFRONTING THE CRISIS IN SCIENCE AND MATH EDUCATION: THE GROWING COMPUTER CRISIS

Gerardus D. Bouw, Department of Math & Comp. Science, Baldwin-Wallace College, Berea, Ohio 44017

The computer industry as well as businesses around the world are calling for more programmers and computer people. Yet the average college graduate with a four-year Computer Science/Data Processing degree has little hope of finding employment. The reason behind this is a curious and unexpected result of the students' fear and avoidance of post-secondary mathematics. The proposed paper will explore that relationship and suggest some ways of dealing with the problem of getting computer science students to take more courses in mathematics.

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H. SCIENCE EDUCATION

FIFTH MORNING SESSION

BUSINESS ADMINISTRATION BUILDING, ROOM 105

JOHN HUG, PRESIDING

## SYMPOSIUM

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"SCIENCES AND MATHEMATICS PROGRAMS"

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9:00 SCIENCE LITERACY BEGINS IN ELEMENTARY AND SECONDARY SCIENCE CLASSES

Dr. John Hug, Consultant Environmental Education and Science Education, Ohio  
Department of Education, 65 S. Front Street, Room 1005, Columbus, Ohio 43215

This presentation will highlight the national trends in science education, summarize the current improvement efforts, and suggest a plan of action for teachers to improve their science teaching. The National Science Teachers Association has written a position statement that describes the objectives of a high quality science program. The Association for Supervision and Curriculum Development has issued a paper describing the crisis in science education. Other statements will also be summarized and distributed. Legislative actions at the federal and state level will be reviewed. Practical suggestions for teachers on improving their own instruction in science and how to help with school district efforts for improvement will be outlined.

10:00 UNDERSTANDING PHOTOSYNTHESIS BY CONSTRUCTING A MODEL

Suzanne B. Rock, Teacher, Bowling Green High School, 530 West Poe Road, Bowling Green, Ohio 43402

A major unit in any introductory high school Biology course is one dealing with the conversion of solar energy into potential (food) energy in the photosynthesis reaction. After viewing the filmstrip entitled "Photosynthesis: Energy from Light," listening to the accompanying tape, and completing a related worksheet, students working in pairs construct models illustrating the process of photosynthesis and its significance to life on Earth. Materials provided in class include construction paper, yarn, string, paper clips, pipe-cleaners, foam stoppers, lids, rubber bands, and any other available items which seem appropriate. Students are encouraged to use any other materials they might think of and to be original and creative. When completed, the models are explained and demonstrated to the class. It is possible to have other teachers or students judge the projects and to award prizes. One which is appropriate is a small house plant with a tag reading, "Have you thanked a green plant today?". Models can also be displayed in a school showcase and serve as the basis for science day projects. In the past, models have included assembly lines, mobiles, bridges, jack-in-the-boxes, and trains. This activity has provided a creative, hands-on experience which helps students grasp the intricacies of a complex biochemical process which is related to their own well-being.

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H. SCIENCE EDUCATION

FIRST AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 116

ED CORLEY, PRESIDING

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1:30 BUSINESS MEETING ROOM 106, BUSINESS ADMIN. BLDG.

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## SYMPOSIUM

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"COMPUTERS IN MATH AND SCIENCE"

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## 1:45 A SYMPOSIUM ON COMPUTERS IN MATH AND SCIENCE

The symposium will be divided into three general segments. During the first part representatives of three major microcomputer companies will discuss their hardware and software packages for Science and Math. Participants will be allowed to attend these sessions in small groups, rotating from one to the other so that they can hear each of the representatives. The second part of the symposium will be sessions presented by teachers currently using microcomputers in their Science and Math classes. Participants will include Ed Corley (National Trail HS---General Science); Jared Crandall (BGSU---Physics); Robert Fyfe (BGSU---Common Pilot Programming Language); Tom Hayes (BGSU---Math); Dave Merronk (BGSU---Graphing Techniques in Math); and Richard Smith (Bexley HS---Chemistry). The remainder of the symposium will be a "Swap Session" with participants given the opportunity to talk to the presenters and share programs and ideas.

As an alternative to the sessions with the sales representatives for the computer companies participants will be given the option of attending a session by Raymond Polchow of Muskingum Technical College on "The Role of Computer-Assisted Instruction in Education."

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## H. SCIENCE EDUCATION

SECOND AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 106

### SYMPOSIUM

#### "UNIVERSITY EXPECTATIONS OF INCOMING STUDENTS IN MATH AND SCIENCE"

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### 1:30 BUSINESS MEETING

1:45 SYMPOSIUM: UNIVERSITY EXPECTATIONS OF STUDENTS ENTERING INTRODUCTORY COURSES IN MATH AND THE SCIENCES.  
Arranged by Spencer E. Reames  
Benjamin Logan High School  
Box 98 (Logan Co. Rd. 5)  
Zanesfield, OH 43360

The purposes of this symposium are to (1) outline the prerequisite skills any student should have when entering any introductory math or science course, (2) outline how well the students have achieved these prerequisite skills, (3) offer suggestions as to how to improve the success of students when they enter the university, and (4) to increase the dialogue between those teaching at the college level and the high school level. The transition from high school to college is often a traumatic experience for many students, however, the trauma experienced can be decreased and the student achievement level increased by increasing the dialogue between those teaching at the high school and college levels.

2:00 CONFRONTING THE CRISIS IN MATHEMATICS EDUCATION. Panel members: William Kirby, Barbara Moses, and Waldemar Weber, Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, Ohio 43403.

The schools of Ohio and the nation are believed to staff approximately half of their mathematics classes with teachers whose competence in mathematics has not been certified. Thus, genuine concerns are emerging about the quality of instruction being provided. Two central issues face public education in Ohio and elsewhere: (1) student achievement is increasingly inadequate and (2) qualified teachers are less available. The 1981 Articulation Report of the Ohio Board of Regents and the State Board of Education has begun to address the first issue by proposing that four years of English and three years each of mathematics, science, social studies, and foreign language be required for unconditional admission in higher education. The panelists will review implications of this report, compare responses of several colleges, and describe the placement procedure for entering students at Bowling Green State University. The second issue reflects two patterns: (a) there has been a sharp drop over the past decade in mathematics majors who graduate from Ohio institutions

with teaching certificates and (b) increasing numbers of teachers trained in mathematics are leaving the teaching profession. There are no easy solutions to this supply problem. In fact, one likely long-range effect is further deterioration in student achievement, which in turn may aggravate the supply problem. The panelists will discuss some possible legislative options for solving these problems.

- 2:45 THE BACKGROUND IN SCIENCE AND MATHEMATICS OF STUDENTS ENTERING GENERAL PHYSICS  
William R. Riley, Department of Physics, The Ohio State University  
Columbus, OH 43210

Pre-professional students who enter the general physics course sequence complete a questionnaire concerning their background in high school mathematics and physics and list the mathematics courses that they have studied at the university. On this first day of class they then respond to a twenty-six item set of exercises intended to determine their actual working knowledge of some of the simple algebraic, geometric, and trigonometric relationships students often encounter in the course sequence. Scores earned on the exercises by a recent group of nearly 700 students will be presented along with data showing nearly constancy of performance over nearly a decade. This is true even with the exercises being returned to students soon after marking, and with little change occurring in the exercises. Related information about grades earned by these students at the end-of-quarter marking will be discussed. New entrance requirements will be discussed.

- 3:00 EFFECTS OF MATH BACKGROUND ON PERFORMANCE IN PHYSICS COURSES  
George W. Ficken, Jr. - Physics Department, Cleveland State University,  
Cleveland, Ohio 44115

Specific examples of the difficulties encountered by students when they attempt to solve homework and test problems will be presented. Actual experiences gained from teaching three different levels of introductory Physics courses show that these difficulties are quite similar. The crucial element is the lack of ability of students to apply the level of Math assumed for the course to the word problems or questions being asked of them. And yet any carry over into real like situations most certainly demands more than the mere ability to manipulate functions and equations. One must somehow get started on the attack by first reading the problem and then writing math equations (or word statements) relating the given quantities to the unknown(s) required in the solution. Attention will also be given to the students' conceptions of the quantitative level at which the course should be pitched, especially those of the non-science majors, and of the study time required of them each week.

- 3:30 WHAT DETERMINES SUCCESS IN GENERAL CHEMISTRY?  
William G. Movius, Coordinator of General Chemistry, Department of Chemistry,  
Kent State University, Kent, OH 44242

Correlations have been made between grades received in general chemistry and several indicators of potential such as high school grades, size of high school, math and science ACT scores, length of time between high school and college. By far the strongest correlation for success in college chemistry is with math ACT scores, although other factors can be important in some cases. Chemistry texts, courses, and professors seem to be able to deal more effectively with a lack of scientific background than with a lack of mathematical background.

- 3:45 THE EXPECTATION OF A UNIVERSITY CHEMISTRY TEACHER FOR THE INCOMING STUDENTS IN FRESHMAN CHEMISTRY. By James Y. Tong. Chemistry Department, Ohio University,  
Athens, Ohio 45701.

I expect the high school graduates (1) to have good study habits (efficient management of free time, taking good notes, reviewing notes daily, and doing homework promptly), (2) to read and understand printed material, to write complete and correct sentences, and to have legible handwriting, (3) to possess basic arithmetic and algebraic skills, to write and to solve simple equations properly, and to interpret simple graphs, (4) to reason logically, and (5) to have some qualitative chemical knowledge.

Personally I would prefer that high schools do not teach the so-called college preparatory chemistry which seems to discourage many students from studying chemistry in college and to give others false confidence in freshman chemistry. Perhaps high school chemistry should emphasize qualitative and applied chemistry and the relationship of chemistry to other disciplines.

## SCIENCE EDUCATION

- 4:15 PREPARING FOR BIOLOGY AT THE OHIO STATE UNIVERSITY. John A. Schmitt. The Ohio State University, 1060 Carmack Rd., Columbus, Ohio 43210

Following a presentation of University-wide and Arts and Sciences requirements, each of our introductory courses will be discussed, speaking to: mode of presentation, clientele for which the course is designed, stated or implied prerequisites, mode of testing, and success of the course as judged by enrollment data and student evaluations.

- 4:30 THE ROLE OF THE SECONDARY SCHOOL IN PREPARING STUDENTS FOR HIGHER EDUCATION IN THE BIOLOGICAL SCIENCES. James M. Freed, Department of Zoology, Ohio Wesleyan University, Delaware, OH 43015

Results of a survey of biological science departments among selected Ohio colleges and universities will be presented. The desirability and the depth of experience by incoming college freshmen in biological sciences in each of the following areas will be discussed: mathematics, physics, chemistry, computer science, specific topics in biological sciences, laboratory studies in the sciences, independent research (e.g., in science day or science fair activities), reading original science literature, and writing of science reports.

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## H. SCIENCE EDUCATION

### THIRD AFTERNOON SESSION

BUSINESS ADMINISTRATION BUILDING, ROOM 104

### SYMPOSIUM

#### "SCIENCES AND MATHEMATICS PROGRAMS"

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- 1:30 BUSINESS MEETING ROOM 106, BUSINESS ADMIN. BLDG.

- 2:00 A TRADITIONAL MIDDLE SCHOOL MATHEMATICS CURRICULUM

Virginia S. Kaiser, Monroe Traditional Middle School, 474 N. Monroe Avenue, Columbus, Ohio 43203

The philosophy of Monroe Traditional Middle School, an alternative school in the Columbus Public Schools, was designed for students who desire the security and challenge of a consistent traditional learning environment. A structured, teacher-directed, orderly learning atmosphere is maintained. Emphasis is placed on traditional values of respect for authority, honesty, patriotism, and hard work. Development of basic skills through the efficient use of school time and home study is aimed at promoting excellence in education.

In the context of the philosophy and operation of Monroe Traditional Middle School, mathematics instruction is centered around improving problem solving skills. Teachers and those interested in the mathematics curriculum will find the approach used at Monroe of interest. Various ways are used to bring the mathematics needed in today's world into the classroom. Mathematics instruction is related to field trips and guest speakers. Mathematics activities are coordinated with other curriculum areas, especially social studies and life science projects. Ways of improving problem solving skills include the following: 1) use of the hand calculator to solve problems; 2) design, collection, analysis, and graphing of data; 3) study of basic economic principles and wise consumer choices; 4) use of newspapers and current events to teach mathematics; and 5) making and using photographs for problem solving.

- 3:00 EXEMPLARY MIDDLE SCHOOL MATHEMATICS PROGRAM

Stephen Tharp, Johnson Park Middle School, 1130 S. Waverly Street, Columbus, Ohio 43204

The exemplary mathematics program at Johnson Park School is based upon two assumptions, 1) that the microcomputer is an effective instructional aid for the mathematics classroom teacher and, 2) the use of microcomputer as a problem solving tool enhances the student's learning capabilities.

Johnson Park Middle School has a computer laboratory with ten Apple II Plus Microcomputers in a network configuration that are presently dedicated to improving student achievement in mathematics, grade seven. Seventh grade mathematics classes are scheduled two periods so the two teachers can group the students according to individual needs. The student's class time each week is divided among group instruction (both large and small), computer assisted instruction (for skill development and concept reinforcement) and the use of the computer as a problem solving tool.

Computer-assisted instruction for the student involves practice to master the basic facts, measuring techniques, recognition of geometric figures, computing areas and perimeters, etc. Computer problem solving involves students in writing programs to solve specific problems and in writing generalized problems such as, add two fractions with unlike denominators.

Testing and class management details are computerized to allow full utilization of the teacher's time in working with students.

#### 4:00 THE BERLIN-MILAN MIDDLE SCHOOL MATH PROGRAM

Josephine Shelly, Berlin-Milan Middle School, 20 Center Street, Berlin Heights, Ohio 44814.

Our mathematics program is designed to develop each student's ability to solve problems by strengthening basic skills and by providing a variety of materials and learning experiences.

Each of our three grades is divided into five levels of achievement. Students may move from one level to another level depending upon the skills they acquire and the effort they put forth. The classes are rotated so every group spends three weeks out of the nine-week grading period with each of the three teachers. Each group spends one of these periods in our math lab, where remediation and extension opportunities are provided. The lab instruction is individualized, based upon I.C.R.T. and other diagnostic testing. Several units are taught in the lab in addition to the individualized program, most notably consumer education and computer literacy. The teacher who is responsible for the lab is assisted by a part-time aide.

All three teachers meet with two sixth, two seventh, and two eighth grade classes during the school day. The teachers have a common planning period every day, which enables them to check student progress and to make changes as needed.

We feel the organization and scope of our program are both unique and educationally sound. Standardized test scores have risen steadily since this program's inception in 1976-1977. Comments that we have received from parents and educators have been very positive.

## H. SCIENCE EDUCATION

### FOURTH AFTERNOON SESSION

BUSINESS ADMINISTRATION BUILDING, ROOM 105

JOHN HUG, PRESIDING

#### SYMPOSIUM

#### "SCIENCES AND MATHEMATICS PROGRAMS"

1:30 BUSINESS MEETING ROOM 106, BUSINESS ADMIN. BLDG.

2:00 FROM "LOGS" TO "CHIPS" IN EIGHT YEARS

Robert R. Smithers, Riverside High School, 200 Moore Street, DeGraff, Ohio 43318

The "logs" might refer to the log cabin that was dismantled, moved fifteen miles, and restored by Riverside students--or the "logs" might be the daily logs kept by students as they operate WDEQ, FM, Riverside's education radio station--the "chips" are in the six computers used by Riverside's elementary and high school students. These projects along with others have provided solid positive experiences for some of our potential drop-outs on through to include our college-bound students.

As a small school district with limited finances, Riverside has tried to use creatively the talents of the students in working out practical solutions to everyday problems. With personal involvement students have a sense of recognition, a feeling of success, and confidence that enables them to better accept the challenges of varied problems encountered in their science and math studies.

How to acquire fifty acres for an outdoor education program involved some monumental mind stretching and was a valuable learning experience. The Riverside Environmental Foundation, Inc., was formed, fifty thousand dollars borrowed, and a 501C3 application approved by the IRS.

Most experiences are exciting and sometimes hazardous. The brown spot on the lab ceiling is a reminder that a chicken manure methane generator got out of hand. The 12 x 24 solar greenhouse on the side of the school is a result of four physics students wanting to do more than a report.



## ANTHROPOLOGY AND SOCIOLOGY

### 3:00 SCIENCE INSTRUCTION THROUGH RESIDENT OUTDOOR EDUCATION PROGRAMS: GRADES 5-8

Thomas N. Hayes, teacher, East Muskingum Middle School, 13125 John Glenn School Road, New Concord, Ohio 43762

The Resident Outdoor Education Program of East Muskingum School District is a program designed to motivate young people to look at the world around them, to help them appreciate the fragile balance between man and nature that exists.

We can teach how man affects his environment and how this change in environment affects mankind. Through this mode of learning a student is more able to grasp how he or she can, as a private citizen, or as a vocation, deal with what is happening to our world.

Our classes are on approximately a 1:9 ratio in the field where one instructor can deal individually with students, helping them realize with first hand observation and experiments the impact that society is having on our community and what could be occurring if present, harmful practices are not corrected.

Field studies revolve around man and his environment and encompass subject matter dealing with the life sciences, geology, astronomy, and meteorology. In addition to the science, we teach related matter in social studies, math and language arts.

We want our children to know and believe that what they do concerning the world around us has great impact not only on them but on the whole of mankind; that we as citizens of this country are responsible for each other.

### 4:00 SCIENCE TEAM TEACHING IN GRADES SIX, SEVEN AND EIGHT

Robert Graham, Department Head, Paul Meyer and Richard Smith, teachers, Berlin-Milan Middle School, Center Street, Berlin Heights, Ohio 44314

During a nine week grading period each student in 7th and 8th grade spends 2/3 of the time in a laboratory type process program, and 1/3 time in the more traditional content setting, which we call mini-units. The seventh grade lab deals with physical science and the eighth grade lab with chemistry.

Mini-units cover topics in biological science, earth science and other areas not covered in the lab. Students in 7th and 8th grade have partners in the lab. Here, students can work at their own speed throughout a chapter. Optional excursions are provided for those who progress at a more rapid rate.

The sixth grade program utilizes a general science text and includes much less lab work. Several class activities highlight the 6th grade program during the year: one being the airplane contest each spring.

The three science teachers each teach two 6th, two 7th, and two 8th grade groups during the school day. They have a common planning period.

Much organization is required to manage the many and varied pieces of equipment used in the lab. An aide is responsible for a large part of the clerical work.

Report cards reflect the variety of skills and topics being taught at each grade level.

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## I. ANTHROPOLOGY AND SOCIOLOGY

MORNING SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 101

M. RUHUL AMIN, PRESIDING

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8:45 RECIDIVISM: A WAY OUT FOR MENTAL PATIENTS. Lynn Meredith Miller  
1015 S. Willow St., Kent, Ohio 44240

This paper reviews past research and notes that efforts to correlate demographic characteristics, clinical diagnoses and types of treatments and follow-up care with the high recidivism rates for mental patients have generally been unproductive.

It is suggested that a more effective approach would focus on the patients' inability to be integrated into society after discharge. More specifically, it is proposed that professional expectations and hospital or ward structures orient patients away from normal societal functioning and interpersonal relationships, thus suppressing their potential for readjustment after discharge and increasing the probability of rehospitalization. Finally, a study is discussed whose results indicate that adopting an orientation toward release without return can significantly reduce recidivism rates for mental patients.

9:00 STRESS AND BLOOD PRESSURE: COMPARISON OF BLACK FEMALE PARENTS IN TWO FAMILY STRUCTURES. Eric J. Bailey. Department of Anthropology, Miami University, Oxford, Ohio 45056.

Cases of essential hypertension may accumulate in populations under constant social and emotional stress. This research investigated stress and blood pressure levels among married and single black parents.

The purpose of this research was as follows: (1) to determine any correlation between blood pressure and stress; and (2) to evaluate the stress factors among females in the two-family structures. Once this was accomplished other important issues can be addressed such as: (1) the possibility that one type of family structure is more apt to have higher blood pressure than another; (2) support the association between environmental factors and essential hypertension; and (3) establish possible preventive treatments against hypertension.

Use of an electronic sphygmomanometer and Spielberger's State-Trait Anxiety Scale indicated that diastolic pressure correlated moderately with the stress questionnaire (.41). This study suggested a possible relationship between family structure and the concept of psychosocial factors in the etiology of essential hypertension.

9:15 ENERGETICS OF CULTIVATION IN WOODLAND INDIAN. R.A. Mostardi, F.J. Smith, and J.L. Gammell. Department of Biology, University of Akron and Akron City Hospital, Akron, Ohio 44325.

The Ohio Hopewell, date to 100 BC to AD 400, and is a cultural focus best known by a complex burial cult, mound, and earthwork construction as well as a copper, mica, and stone technology. This work deals with the cultivation of a cultigen complex recorded in the archaeological data for that period. Specifically, this research was designed to answer several questions concerning the energy efficiency of cultivating these crops using input/yield methodology.

The garden was located in Clinton, Summit County, Ohio and measured approximately 15 x 35 feet and was similar to a garden plot that would have been found in a small woodland clearing. Following ground preparations made with a digging stick and a flint hoe, the following cultigens were planted: maize, squash, gourds, sunflower, and Jerusalem artichoke.

The caloric expenditure for planting, weeding, and harvesting were determined using open circuit spirometric methods. The total amount of time at the various tasks of gardening were recorded in a time/motion study so that accurate caloric expenditures could be calculated. Caloric content of each of the cultigens were determined using a Phillipson microbomb calorimeter. These data produced an input/yield ratio of 1:2.7-1:6.2, for the whole gardening complex, and a very large yield of 1:60 for the Jerusalem artichoke during one of the seasons. These compare favorably with data for gather-hunters, pastoralists, and tropical horticulturists who have been measured using similar methods, from studies done in Africa and New Guinea.

9:30 DYNAMIC DEMOGRAPHICS: PROFILE OF AN AGING POPULATION  
Theresa Walter, U.S. General Accounting Office, Room 2933,  
1240 East Ninth Street, Cleveland, Ohio 44199

One of the most striking demographic trends of the twentieth century has been the aging of the United States population. While all age groups have grown and continue to do so, the population of older people is growing faster. If you compare the 1920 statistics to the year 2020, only the people in two age groups, 45 to 64 and 65 and over, will have grown in real terms; that is, become a larger portion of the population.

The responsibility of supporting the old and young falls upon the working age group. For every person in the United States under age 20 and over 64 there is another person between the ages 20 and 64 in a supportive role. Although the age mix of the United States population continues to change, this ratio will remain relatively constant for the next 40 years.

A majority of society's support, that is, those people ages 20 to 64 who support the old and young, are women. This trend continues into the future. In 1980, 51 percent of the support group were women. In 2020, women will remain 51 percent of this group.

Traditionally, women have worked in the home and supported other people in their families and communities. However, women have been increasingly participating in the labor force since 1950. This working trend indicates the support women have provided in the past may not be as readily available in the future.

Our paper will discuss these and other demographics.

## ANTHROPOLOGY AND SOCIOLOGY

- 9:45 AGING ISSUES IN THE 1980S: A COMPUTERIZED INFORMATION SYSTEM  
William Laurie, U.S. General Accounting Office, Room 2933,  
1240 East Ninth Street, Cleveland, Ohio 44199

The White House Conference on Aging generated a wealth of data on issues in the field of aging particularly the 50 State Conferences on Aging. Over 1500 pages of narrative containing over 3000 issues are contained in these state reports. The data, however, is buried in these reports and is not easily summarized.

We developed a conceptual model focusing on the well being of older people containing three dimensions--health, economic, and social. Using this model, we computerized the issues in seven State Conference on Aging reports. We were successful in developing an information system on these issues.

In health, the major area of concern was long term care; in economic, employment; and in social, quality of life. Most areas of concern we found will have a budget impact. In the health dimension, long term care means expanded coverage and health research requires funding. Further, in the economic dimension, employment means longer worklife and social security demands status quo. And finally, in the social dimension, a holistic approach means increased use of services. Our paper will describe the model and the results of the computerized information system.

- 10:00 A NEW GENERATION OF IMMIGRANTS IN THE UNITED STATES. M. H. Namazi, Department of  
of Sociology, The University of Akron, Akron, Ohio 44325.

The immigration Act of 1965 alleviated the effect of the long established and disputed national-origin quota policy of 1952, and substituted an ostensibly less discriminating Act. This new Act (1965) restricted the number of immigrants to 20,000 per country, and instituted a ceiling of 120,000 on immigrants from the Western Hemisphere annually. These modifications have drastically affected the characteristics of the recent immigrants in a variety of ways. This paper will analyze the discrepancies between the recent immigrants and those of earlier generations.

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## I. ANTHROPOLOGY AND SOCIOLOGY

FIRST AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 101

M. RUHUL AMIN, PRESIDING

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### 1:30 BUSINESS MEETING

- 1:45 A QUARTER CENTURY OF SEXISM IN THE READER'S DIGEST: CONTENT ANALYSIS OF A HUMOR COLUMN. Dennis H. Ofstein, Dept. of Sociology, The University of Akron, Akron, OH 44325.

Despite efforts to reduce or eliminate sexism in America, there are indications that the portrayal of men and women in the mass media continues to perpetuate a sexist ideology. This paper reports the results of a content analysis of the humor column "Laughter, the Best Medicine" over a twenty-five year period between 1957 and 1982. Because humor may be an insidious vehicle for the transmission of sexism, continued evidence of sexist humor suggests a lack of progress in eliminating sexism in America. The extent to which such humor is conveyed by one of the most widely circulated general magazines in the country may signal the extent to which sexism exists in America in the early 1980s.

- 2:15 MEN AND WOMEN AS PORTRAYED IN THE LYRICS OF CONTEMPORARY MUSIC. Colleen Hyden and N. Jane McCandless, Department of Sociology, University of Akron, Akron, OH, 44325.

In addition to other agents of socialization, contemporary music provides a rich source of information depicting the stereotypes of males and females in society. While the stereotypic images of males and females have been explored in other areas of the media, contemporary music has been largely neglected in this respect. This paper reports the results of a content analysis of popular songs over a ten year period between 1972 and 1982. Because music is a lucrative medium for the transmission of sex roles, the extent to which sexism is conveyed by contemporary songs questions the belief by many authors that a change in sex role stereotypes has occurred.

- 3:00 REPRODUCTION AND HEREDITY BELIEFS OF THE HINDUS, BASED ON THEIR SACRED BOOKS. Alain Corcos, Department of Natural Science, Michigan State University, East Lansing, Michigan 48824.

Hindus see their children as the reincarnation of the husband. The mother is only a field where the father lays his seed. That the reincarnated husband might be a girl is explained by a more abundant female "semen." Differences among children are explained by the influence of the mother, the same way as a seedling is affected by the soil in which it grows. Because a son is generally desired, one can find in the sacred books of India rules which might increase the chances not only to have a son, but a healthy and gifted one.

- 3:15 BEHAVIOR, CHANGE AND SURVIVAL OF RESOURCE SCARCE ORGANIZATIONS IN THE HUMAN SERVICE SECTOR: ALTERNATIVE APPROACHES Foster S. Buchtel and M. Ruhul Amin, Dept. of Sociology, The University of Akron, Akron, OH 44325

The literature and understanding of organizations is scant regarding a systematic strategy for problems of no-growth and negative growth organizations. Most organizational theory has been based on the assumption of expansion with little attention directed toward organizations facing resource cutbacks. The literature is insensitive to the range of interpersonal and strategic problems that are created by resource scarcity, and growth oriented strategies for maintaining satisfactory levels of productivity and morale become inadequate when the scarcity of resources threatens the normal organizational reward system. Although some attempts have been made recently to address these problems and possible solutions, they have not been based on a systematic investigation allowing for the rigorous evaluation of alternative approaches. An exception is a study being conducted to create a systematic and comprehensive body of data for the evaluation of alternative approaches to managing resource scarce organizations. The study includes an indepth analysis of public and private agencies experiencing cutbacks, using data collected through (1) interviews with the agency director to collect information on five basic organizational characteristics and (2) questionnaires given to all employees of each agency soliciting information concerning e.g., employee background, job satisfaction, and reactions to declining organizational resources and changing workloads. Measures of organizational effectiveness and response to resource scarcity were derived and correlated to determine the most effective organizational responses to resource scarcity.

- 3:45 INTERORGANIZATIONAL COORDINATION IN HUMAN SERVICES DELIVERY. Richard Saini/ David Lim/ Mike Jaeger. Box #816 Leebriick Hall, Kent, OH 44243

Proper delivery of health care to the elderly is a major problem in today's health care system. The problem centers around the complex interorganizational network which delivers such services. The effect of a unique coordination project on an interorganizational network of county-wide basis was qualitatively analyzed through research and interviews using an open-systems approach, a relational perspective, and a social systems approach. The dimensions used were homogeneity, stability, environmental capacity, formalization, intensity, reciprocity, and standardization. Data showed that a good deal of coordination has been brought about in this network through application of these variables. Areas for improvement are presented for the establishment of an efficiently running interorganizational collectivity. It is sincerely hoped that such social systems may be established in an attempt to deliver better care to the elderly.

- 4:00 AN EXAMINATION OF INTERPROFESSIONAL COMMUNICATION AND COORDINATION OF DISCHARGE PLANNING WITHIN AN ACUTE CARE FACILITY Matthew Jaeger, Renee Caputo, John Park, Yong Sook Lynda Lee Box 60 Apple Kent, Ohio 44243

Discharge planning is the primary step in providing continuity of care for the elderly after discharge from an acute care facility. Discharge planning is necessary in moving the elderly from an institutional level of care to a continuum of services beyond institutionalization. The actual planning service arrangement is dependent upon the type of institution, and, more importantly, upon the professionals actually engaged in collaborative activities for the patient's benefit. Professional interactions can be approached on several different levels, including: the organizational level, in which persons from different professions interact in an organizational hierarchy; the level of ideals, in which a professional's role in discharge planning is influenced by the values he holds for his organization, profession, and person; and the level of ideal interaction, in which a professional's values are influenced by his co-worker's ideals. This is a model system based on these levels of interaction, in an attempt to explain the problems associated in maintaining the proper communication required for adequate discharge planning. The model is a general outline that may be used to prevent a patient's loss in the home health care system, by pointing out the many different levels of communication involved, and where planning discrepancies tend to occur. The model is based on a series of informal interviews with the personnel involved in various positions in the planning structure of three acute care facilities and a home nursing service.

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I. ANTHROPOLOGY AND SOCIOLOGY

SECOND AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 102

JOHNATHAN BOWEN, PRESIDING

SYMPOSIUM

"CURRENT RESEARCH IN OHIO AREA ARCHEOLOGY"

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1:30 BUSINESS MEETING ROOM 101, BUSINESS ADMIN. BLDG.

2:10 THE BLUE CREEK BIFURCATE: A PRELIMINARY DEFINITION FOR AN EARLY ARCHAIC POINT TYPE. James H. Payne, Laboratories of Ethnoarchaeology, University of Toledo, Toledo, Ohio 43606.

A preliminary definition is given for the Blue Creek Bifurcate point type. This regional variant on the early Archaic bifurcate theme is compared and contrasted to the related MacCorkle Stemmed and St. Albans Side-Notched point forms. Attributes that are commonly found on Blue Creek Bifurcate points include: the exclusive use of Upper Mercer chert variants and Pipe Creek chert; manufactured on relatively large, thin, twisted flakes; pseudo-parallel flaking; serration; bifurcated bases; and an approximate length to width ratio of 2:1.

2:20 AN OVERVIEW OF THE SANDUSKY BAY ARCHAEOLOGICAL PROJECT: NON-COMPLIANCE NON-ACADEMIC RESEARCH. Jonathan Bowen, Department of Archaeology, The Ohio Historical Society, Columbus, Ohio 43211.

Most archaeological programs in the eastern United States are oriented toward compliance with governmental preservation regulations, are attached to degree-granting academic institutions, or both. A number, however, are not. The Sandusky Bay Archaeological Project will be carefully examined and analyzed as an example of such a program. Like most such programs, this project functions with minimal professional personnel and has no students at its disposal. Also, in this case, the headquarters are located many miles outside the project area. These factors have greatly influenced the tactics employed. Much responsibility has been placed on avocational, volunteer personnel.

2:40 THE DOCTORS SITE (33LU11): CURRENT RESEARCH ON THE YOUNGE PHASE OF THE WESTERN BASIN TRADITION. Brian G. Redmond, Laboratories of Ethnoarchaeology, University of Toledo, Toledo, Ohio 43606.

The Late Woodland Younger phase was originally defined by Fitting and represents the time period from approximately A.D. 1000 to A.D. 1200. Current research and analysis of archaeological data by archaeologists at the University of Toledo Laboratories of Ethnoarchaeology have led to various conclusions and interpretations of Younger phase cultural dynamics. Most recently this research has taken the form of an in-depth analysis of archaeological material from several Younger phase sites in northwestern Ohio including the Doctors site. The analysis of material from these Younger phase components will provide a more complete and understandable interpretation of Late Woodland culture in the Western Basin of Lake Erie.

3:00 BREAK

3:10 THE BUTLER SITE REVISITED: NEW PERSPECTIVES ON THE IROQUOIS CO-TRADITION. David M. Stothers, Laboratories of Ethnoarchaeology, University of Toledo, Toledo, Ohio 43606.

The recent analysis of the cultural assemblage from the Butler site (originally located outside Detroit, Michigan) has added new dimensions to the understanding of prehistoric cultural development in the western Lake Erie drainage basin. Cultural materials from the site suggest cultural continuity between the Younger Sequence of the Western Basin Tradition and the western branch of the Ontario Iroquois Tradition. This information supports the hypothesis concerning the prehistoric cultural convergence and two separate and distinct Iroquoian cultural traditions. This cultural convergence is believed to have been the result of the territorial invasion and military defeat of the Western Basin Iroquois by the Sandusky Tradition 'Fire Nation'.

- 3:30 A PALAEOPATHOLOGICAL ANALYSIS OF A 15TH CENTURY A.D. SANDUSKY TRADITION SKELETAL POPULATION FROM THE SANDUSKY BAY/HURON RIVER DRAINAGE. Tim Abel, Sandusky Bay Volunteer Corps, 624 E. State Street, Fremont, Ohio 43420.

A sample of 110 human burials were excavated from a cemetery in the Gibbs Settlement Area in Riley Township, Sandusky County, Ohio in 1982. The skeletal remains, most of which are well preserved, represent each age group from infancy through senility. The pathological conditions noted in this sample include osteomyelitis, osteoarthritis, and trauma, both healed and unhealed.

- 3:50 AN EXAMINATION OF THE UPPER MISSISSIPPIAN COMPONENT AT THE WILLIAMS SITE. Susan B. Conway and David M. Stothers, Laboratories of Ethnoarchaeology, University of Toledo, Toledo, Ohio 43606.

The Williams Site (33W07b) is located on the south bank of the Maumee River in Wood County, Ohio. This Upper Mississippian (Wolf phase) component contained both grit and shell tempered ceramics, and based on the co-occurrence of these two types of tempering, various stylistic attributes (Parker Festooned motifs and strap handles), and the several radiocarbon dates received for this site, it is believed that this component represents an Upper Mississippian, Sandusky Tradition, Wolf phase site.

- 4:10 PARKER FESTOONED: A CERAMIC TYPE REDEFINED. James R. Graves, Laboratories of Ethnoarchaeology, University of Toledo, Toledo, Ohio 43606.

The ceramic type 'Parker Festooned' is the most characteristic pottery type associated with the Wolf phase (ca. A.D. 1200-1400) of the Sandusky Tradition. Parker Festooned ceramic design motifs have a considerable time depth and are displayed in ceramic assemblages recovered from sites over a large geographic region. Using the available radiocarbon dates (associated with this ornate and garish ceramic type) in conjunction with comparative data from numerous sites, a refinement of this pottery type is obtained. These spatial and temporal considerations have broad interpretive implications for demonstrating continuity through time and across space within the Sandusky Tradition. It is further concluded that the Wolf phase, as presently understood, is associated with the Upper Mississippian prehistoric to historic development of the Central Algonkian speaking Assistaeronon (Nation du Feu) and thus part of the more inclusive Prairie Peninsula Co-Tradition.

## J. CONSERVATION

MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 332

JOHN L. HEYWOOD, PRESIDING

The papers in the Conservation Section's technical sessions represent a research effort to understand the recreational, social and behavioral aspects of Ohio's natural areas, and to develop and test management strategies to control and direct recreational use of these natural resources.

- 9:30 COMPARISON OF SELECTED CHARACTERISTICS OF VISITORS TO FOUR CENTRAL OHIO NATURAL AREAS. Michael K. Maynard and Gary W. Mullins. The Ohio State University, School of Natural Resources, 2021 Coffey Rd., Columbus, OH 43210.

The planning, management and administration of natural areas and preserves require ready access to factual data on the natural, organizational and social resources available to such sites. While natural resources inventories and agency policies, budgets and constraints are known or readily available to natural areas decision-makers, data regarding potential visitor characteristics and behaviors have not been readily or inexpensively available. On- and off-site visitor surveys, statewide participation studies, demographic trend analyses and other methods for obtaining probable visitation data can be useful but are often costly and time-consuming to undertake. One source which does not suffer from these limitations is Unobtrusive Visitor Observation. This technique allows trained observers to collect data on actual visitors on-site, without affecting what those visitors do while on-site. Unobtrusive Visitor Observation was employed at four Central Ohio designated State Nature Preserves from May through October 1982. Two observers collected data on the characteristics and behaviors of 478 visitor groups, and these data were then analyzed in order to explore the relationships between preserve type, day, time, weather, visitor group characteristics, recreational equipment used, recreational behaviors and depreciative behaviors.

- 10:00 VISITOR PERCEPTIONS OF THE RECREATIONAL SENSITIVITY OF NATURAL AREAS. John L. Heywood and Gary W. Mullins. Ohio State University, School of Natural Resources, 2021 Coffey Rd., Columbus, Ohio 43210.

Natural areas in Ohio are primarily managed to preserve natural features for their educational and scientific interest and use. Natural areas also attract visitors

## CONSERVATION

who come primarily for recreational activities. Recreation sensitivity is defined as the degree of tolerance or susceptibility of an area or site to change. Visitors (n=201) perceptions of the sensitivity of two natural areas were measured on four scales contained in a self-administered questionnaire distributed during the summer of 1982. The scales operationalize the dependent variable of sensitivity and independent variables of recreation values, recreation opportunities, and recreation use intensity. The hypothesis that sensitivity is determined by perceptions of values, appropriate activities, and use level will be tested through path analysis of the conceptual model. The role of other intervening variables, such as the social group of participation and socio-economic characteristics, will be determined through step-wise multiple regression

- 10:30 DEVELOPING SEMANTIC DIFFERENTIAL SCALES FOR USE IN NATURAL LANDSCAPE PERCEPTION STUDIES. John L. Heywood and Kimberly A. Funk. The Ohio State University, School of Natural Resources, 2021 Coffey Rd., Columbus, OH 43210.

The natural landscape presents a variety of visual stimuli to the viewer which are interpreted in terms of his interests, values, and moods. The aspects or variables perceived are both physical and conceptual in nature. Examples of variables are trees, people, buildings, color, and form. Such variables influence the perception of landscape scenic quality and have been found to be a critical factor in public preference for particular landscapes. Semantic differential provides a methodology to develop scales to measure reactions to natural landscape variables. The semantic differential technique originated in research on synesthesia -- the auditory stimuli that arouse visual images or affect the quality of visual sensations. These studies used descriptive adjectives in the investigation of color, mood, and music interrelationships. Eventually continuums between polar adjectives were established. Semantic differential scales for Ohio's natural landscapes were developed by showing a group of 30 natural resource students at The Ohio State University a series of 60 color slides of scenery from Ohio's Natural Areas and Preserves. Participants were asked to write a word or words describing their reaction to each of the 60 scenes. Content analysis of these word lists produced a list of descriptive adjectives. These were then analyzed to develop a set of bipolar semantic differential scales -- for example a scale of beautiful to ugly. Twenty scales were established which will be used in studies of visitors' and managers' perceptions of Ohio's Natural Areas and Preserves.

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### J. CONSERVATION

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 332

JOHN L. HEYWOOD, PRESIDING

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- 1:30 BUSINESS MEETING

- 2:00 PERCEPTIONS OF NATURAL AREA MANAGERS TOWARDS RESOURCES AND VISITORS. Kathleen Rettig Race, John L. Heywood, Gary W. Mullins. School of Natural Resources, Div. of Parks and Recreation Adm., OSU, 2021 Coffey Road, Columbus, OH 43210.

Upper and mid-level managers of Ohio's dedicated natural areas are being surveyed to identify their attitudes and perceptions toward resource qualities, resource management practices, visitors and visitors' attitudes/perceptions. The survey was developed to parallel five visitor studies currently in progress which directly relate to the four categories of management concern listed above. Past studies of natural resource managers have tended to focus on organizational structures, decision making frameworks and interpersonal relationships. The focus of this study is to view natural area managers as members of a social-cultural group that adheres to a common set of behavioral norms, beliefs and values. The results of this study will provide a data base concerning managers' perceptions and attitudes toward four major types of criteria used in their management decision making process. This data will also be used in a further study which will compare managers' and visitors' perceptions and attitudes toward natural areas to form a more complete picture of natural area managers' understanding of visitors' attitudes, perceptions and observed behavior.

- 2:30 UTILIZING CONSERVATION EDUCATION STRATEGIES AS A VISITOR MANAGEMENT TOOL IN OHIO STATE NATURE PRESERVES. Dr. Mary Lynne Bowman and Edward C. Olson, 383 Kottman Hall, 2021 Coffey Road, Columbus, Ohio 43210.

Visitor sociodemographic information and visitor knowledge of and attitudes toward natural areas management and use were analyzed and used as a basis for the development of a conservation education strategy. This strategy was aimed at increasing the visitor's level of knowledge and positively affecting attitudes toward preservation of natural areas and the management and use of those areas. A stratified random sample of visitors at four Ohio state nature preserves was taken. Data were obtained by a 35 item questionnaire. Results from 168 questionnaires showed preserve visitors to be mostly male, age 20-39, with an income of \$10,000-\$30,000 with few holding memberships in either community or conservation groups. Most

were frequent visitors to nature preserves, were very satisfied with their most recent visit, and come to the area in small groups of either family members or friends for solitude and to sightsee. Visitors scored poorly on an assessment of their knowledge of preserve management, policies and regulations. Visitors also held negative or neutral attitudes toward these same policies and regulations. These data were used to develop an educational strategy utilizing brochures, signs and personal services. Guidelines were developed to assist managers and educators in utilizing conservation education as a management tool.

3:00 PRESERVATION OF PICKERINGTON MARSH Dr. Monica Nees, The Ohio State University, School of Natural Resources, 383 Kottman Hall, Columbus, Ohio 43210

Pickerington Marsh is the last surviving wetland of its kind in central Ohio. A collection of small marshes and several seasonal ponds with surrounding uplands, it is located 12 miles southeast of downtown Columbus. The marsh is one of the finest birding sites in all of Ohio. More than 240 species of birds have been sighted there, including almost all species of waterfowl ever recorded in Ohio.

In 1972 conservationists from the Columbus area formed the Pickerington Ponds Committee, under the sponsorship of The Ohio Chapter of The Nature Conservancy to acquire the Marsh and preserve it from both agricultural and urban development. By late 1982, 262 acres had been obtained, with 113 still under negotiation. Extensive interviews and examinations of organizational files revealed several reasons for the slow pace: lengthy real estate negotiations, timing of crucial fundraising activities, and the complex interrelationships needed for the many private individuals and groups involved to acquire the Marsh.

3:30 RECREATIONAL USE OF URBAN FOREST RESOURCES. Gary W. Mullins and John L. Heywood, Assistant Professors, The Ohio State University, School of Natural Resources, Division of Parks and Recreation Administration, Room 465, 2021 Coffey Road, Columbus, Ohio 43210.

Conservation entails wise use of resources. The Division of Parks and Recreation at The Ohio State University is engaged in a study of how residents in Columbus, Ohio conserve and use urban forests for recreation and leisure purposes. The paper entails the methodology and approach that the Division is taking to investigate this problem. The intent of the study is to gain a more indepth understanding of the role of the urban forest environment in meeting recreational needs.

Urban forests are broadly conceptualized as any public or private open space in an urban area. From the perspective of human ecology, urban forest recreation can be viewed in terms of the systems of interrelationships between people, their environment, leisure service institutions and associated technologies. This study seeks to investigate the interactions of people, places, institutions and activities in urban forest settings.

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## K. GENETICS AND CELL BIOLOGY

MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 515

LOU GLATZER, PRESIDING

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8:30 SPECIES IDENTIFICATION IN HAWAIIAN DROSOPHILA UTILIZING MOUTHPARTS AND EGG CHORION. Jay T. Hairston and Jong S. Yoon, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Even though the Hawaiian Drosophila displays the greatest structural diversity and characteristics of any species in known areas of the world, many sibling species are still existing in this fauna. In these sibling species groups, structural peculiarities of



the mouthparts and leg modifications are only found in the male sex, which leads to difficulty in identifying females of different species: females of different species look more alike in the group. With the aid of scanning electron microscopy, morphological comparisons were made to distinguish between four species (*D. mimica*, *D. kambyse*, *D. europeza* and *D. biseriata* of the "modified mouthparts" species group), since intensive studies of cytogenetics and molecular genetics are being conducted by many geneticists. The mouthparts and egg chorions were studied according to the techniques previously described (Hairston and Yoon, 1981; 1982). Differences in species were observed by noting the spine arrangements on the labelum and medi-proboscis of the modified mouthparts, and the structural differentiation in the egg chorions. From these observations, it is evident that scanning electron microscopic micrograph analysis can provide a means of classification and identification of both described and undescribed species. Furthermore, the egg chorion can be invaluable for species identification, when neither male nor female parents are available. (Supported by NSF Grant DEB 80-11552).

8:45 A TEST OF A NEW MODEL FOR SPERM COMPETITION IN *DROSOPHILA MELANOGASTER*. Jack Letsinger. Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Experimental evidence is being collected to test predictions of a new model for sperm competition (Gronko, in prep.). The new model proposes sperm dilution and sperm aging, and not displacement, as factors to explain sperm competition data. The model contains three parameters,  $P'$ ,  $P_2$ , and COST.  $P'$  is the number of first male progeny produced before remating divided by a single mating control value, and measures the effectiveness of males at delaying female remating.  $P_2$  is the proportion of progeny produced following remating which are sired by the second male. COST is a measure of the proportional reduction in first male productivity due to remating. The model predicts that  $P'$  and  $P_2$  will be positively correlated while  $P_2$  and COST will be negatively correlated. The model also states that cost to the first male is generally low.--Virgin *Drosophila melanogaster* females were mated and then given the opportunity to remate for two hours in the morning. Control groups consisted of single matings for each strain. Productivities for first and second males were assessed and  $P'$ ,  $P_2$ , and COST calculated.--Various strains of *D. melanogaster* were selected from the literature to ensure that strains with widely variable  $P_2$  values were tested. The relationship of  $P_2$  to  $P'$  and COST in these strains is compared to predictions of the model.

9:00 CHARACTERIZATION OF ECDYSONE 20-MONOOXYGENASE ACTIVITY IN THIRD INSTAR LARVAE OF *DROSOPHILA MELANOGASTER*. Martin J. Mitchell and Stan L. Smith, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Previous studies with non-dipteran insects have established that ecdysone 20-monooxygenase (the enzyme system responsible for the conversion of the inactive molting hormone, ecdysone, to the active hormone, 20-hydroxyecdysone) is a cytochrome P-450 dependent monooxygenase. Since *Drosophila* is an ideal organism for genetically dissecting both the structural and regulatory elements of P-450 mediated systems, as a prelude to such genetic studies we have developed an *in vitro* radioassay for the detection, quantification and characterization of ecdysone 20-monooxygenase activity in *Drosophila*. Using this radioassay, ecdysone 20-monooxygenase activity has been found to be present in wandering stage larvae. Differential centrifugation studies suggest that at least two ecdysone 20-monooxygenases are present in these larvae, a mitochondrial and a microsomal system. Both monooxygenase systems show an obligatory requirement for NADPH and are inhibited by compounds known to inhibit P-450 mediated systems, e.g., metyrapone, p-aminoglutethimide, p-chloromercuribenzoate, carbon monoxide. Although the kinetic characteristics and photochemical action spectra of these monooxygenases have yet to be assessed, the data to date are consistent with the view that these monooxygenases are P-450 dependent. In addition, the radioassay has proven to be sensitive down to the pg range suggesting that it will prove to be an invaluable tool for the screening and detection of ecdysone 20-monooxygenase mutants in *Drosophila*. Supported by FRC and NIH Biomed Grants, Bowling Green State University.

9:15 ECDYSONE 20-MONOOXYGENASE ACTIVITY IN ADULT FEMALE *Aedes Aegypti* MOSQUITOES. Stan L. Smith, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Previous studies have suggested that 20-hydroxyecdysone is a putative vitellogenin stimulating hormone (VSH) responsible for posteclosion vitellogenesis and ovarian maturation in blood fed anautogenous mosquitoes such as *Aedes aegypti*. However, the ovaries (source of VSH) in adult *Aedes* synthesize and secrete only ecdysone. If 20-hydroxyecdysone is indeed VSH then the possibility exists that the conversion of ecdysone to 20-hydroxyecdysone may well be a rate-limiting and/or blood meal induced reaction necessary for the completion of the mosquito gonadotropic cycle. To test in part this possibility, the enzyme system responsible for the C-20 hydroxylation of ecdysone to 20-hydroxyecdysone, ecdysone 20-monooxygenase (e-20-m), was examined in blood fed and unfed *Aedes aegypti* using *in vitro* radioassay and chromatographic methods. E-20-m activity in unfed *Aedes* was found to be at basal levels; whereas in blood fed

Aedes e-20-m activity rose slightly from basal levels for 8 hr post feeding and then increased dramatically until 24 hr post blood meal. Decapitation studies with unfed and blood fed mosquitoes revealed that the dramatic increase in e-20-m activity in blood fed Aedes was not a direct and nonspecific effect of the blood meal per se but was instead mediated by a head factor released between 8 and 16 hr post feeding. While these data do not prove that 20-hydroxyecdysone is VSH, they are in accord with the supposition that this ecdysteroid is involved in the posteclosion gonadotropic maturation events of Aedes. Supported by FRC and NIH Biomed Grants, Bowling Green State University.

9:30 THE EFFECTS OF PLANT ALLELOCHEMICS ON MANDUCA SEXTA ECDYSONE 20-MONOOXYGENASE ACTIVITY. Stan L. Smith. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

Ecdysone 20-monooxygenase (e-20-m) is the cytochrome P-450 dependent steroid hydroxylase responsible for the conversion of the inactive molting hormone, ecdysone, to the active form, 20-hydroxyecdysone. Since this enzyme catalyzes a reaction essential for insect postembryonic development it was of interest to test the effects of several plant allelochemicals on e-20-m activity. Homogenates of fat body and midgut from fifth instar larvae of the tobacco hornworm were incubated with varying concentrations ( $10^{-8}$  to  $10^{-4}$ M) of test allelochemical and the e-20-m activities quantified by radioassay. The data revealed that precocene II, rubijervine and tomatine did not affect e-20-m activity. Phlorizin and phloretin inhibited both tissue e-20-m activities ( $I_{50}'_s \approx 10^{-4}$  to  $10^{-6}$ M). Likewise, rutin and quercetin inhibited midgut e-20-m activity ( $I_{50}'_s \approx 10^{-4}$  to  $10^{-5}$ M) but, in contrast, activated fat body e-20-m activity ( $A_{50}'_s \approx 10^{-5}$  to  $10^{-6}$ M). This is the first direct demonstration that naturally occurring plant products can affect insect molting hormone synthesis. Although it remains to be established if these and other related allelochemicals will elicit similar effects when tested *in vivo*, such experiments are in progress and may prove useful in our understanding of ecdysteroid biosynthesis as well as plant-insect interactions. Supported by NIH-Biomed and Bowling Green State University FRC grants.

9:45 THE INFLUENCE OF HYBRID DYSGENESIS ON THE RATE OF MOVEMENT OF TRANSPOSABLE DNA ELEMENTS IN DROSOPHILA MELANOGASTER. R.C. Woodruff, J.L. Blount and J.N. Thompson, Jr., Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403, Department of Biology, Mount Union College, Alliance, Ohio 44601, and Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019.

It has recently been observed that many spontaneous mutations in D. melanogaster contain inserts of large DNA transposable elements (TE) (Levis et al., 1982, Cell 30:551 and references therein). In some cases additional mutational changes or reversions of insertion mutations are mediated by excision of these TE. As an initial attempt to study the genetic control of the rate of movement of TE in eukaryotes, we have measured the ability of hybrid dysgenesis (HD) (a syndrome of genetic changes that occurs among the progeny of crosses between certain strains of D. melanogaster) to affect the rate of reversion or mutation of mutants that contain the following TE:  $w^a$  = copia insert,  $w^c$  = FB insert,  $w^{hd}$  = P insert. As has previously been observed (Rubin et al., 1982, Cell 29:987), the reversion rate of  $w^{hd}$  mutants is significantly increased by HD (total rates of reversion for three  $w^{hd}$  mutants are 2/34,708 (0.01%) in absence of HD and 22/17,701 (0.12%) in presence of HD). On the contrary, we have not observed a clear influence of HD on reversion or mutation of  $w^a$  or  $w^c$ :  $w^a$  = 0/21,396 vs  $w^a$  + HD = 0/38,398;  $w^c$  = 402/33,796 - 1.19% vs  $w^c$  + HD = 205/37,262 - 0.55%. These preliminary data suggest that HD does not significantly increase the rate of movement of all TE. Additional experiments are in progress to determine if chemical mutagens can modulate these rates.

10:00 BREAK

10:15 PLASMID MEDIATED ENHANCEMENT OF MUTAGEN RESISTANCE AND CHEMICALLY INDUCED MUTAGENESIS. Gregory R. Jarosik and Doris J. Beck, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

The ability of two plasmids, pKM101 and N3, to enhance induced and spontaneous mutagenesis, and to enhance the survival of cells treated with mutagenic agents was tested in Escherichia coli. Enhancement of mutagenesis was determined utilizing a modified Ames test for detecting mutagens. Both plasmids significantly enhanced methyl methanesulfonate (MMS), N-methyl-N'-nitro-N-nitrosoguanidine (NTG), and cis-platinum(II)diamminedichloride (cis-PDD) mutagenesis and cell survival following exposure to U.V. light, cis-PDD, and NTG in  $recA^+$  and  $recA431$  (protease deficient) strains. Both plasmids enhanced survival following exposure to MMS in  $recA^+$  cells but not in  $recA431$  cells while spontaneous mutation was enhanced in both strains. N3 enhanced U.V. mutagenesis in  $recA^+$  and  $recA431$  strains. In contrast, no plasmid mediated enhancement of mutagenesis or cell survival was seen in  $recA13$  strains lacking all  $recA$  functions. Thus, the ability of the plasmids to enhance cell survival and mutagenesis was dependent on a functional  $recA$  gene. Deficiency of proteolytic activity in the  $recA$  protein as a result of the  $recA431$  mutation did not affect the ability of either plasmid to enhance mutagenesis or cell survival. Deficiency of genetic recombination in  $recA142$  mutants, however, did prevent enhancement of MMS mutagenesis.

10:30 X CHROMOSOME ACTIVITY IN HUMAN EXTRAEMBRYONIC MEMBRANES. Kathleen Bailey Harrison, Dept. of Biological Sciences, Wright State University, Dayton, Ohio 45435.

In all female mammals, one of the two X chromosomes in every cell of the conceptus is inactivated early in development. In the fetus itself, inactivation is random with regard to parental derivation of the X chromosome. In rodents, however, the paternally derived X has been shown to be preferentially inactivated in the earliest differentiating tissues of the placenta (trophoblast and extraembryonic endoderm). Previous studies examining this question in humans, using glucose-6-phosphate dehydrogenase (G6PD) variants, have not yielded definitive answers because of small numbers, contamination with maternal enzyme, and low G6PD levels in full-term placental membranes. In the present study these problems have been overcome by careful tissue dissection and culturing of placental components. Informative cases are those in which fetal tissues are heterozygous for G6PD(AB) and the mother is homozygous (AA or BB), thus identifying the parental source of each allele. Fetal tissues of the placenta showing greater expression of one allele indicate nonrandom inactivation of the X chromosome. Results suggest that, in the human, preferential paternal X chromosome inactivation occurs in amnion, chorion, and particularly, villi. These tissues are derivatives of cytotrophoblast, the earliest differentiating cells of the human blastula. Large numbers of these cells are found in villi, which contain numerous cytotrophoblastic islands.

10:45 DIFFERENTIAL RESPONSE OF SEA URCHIN EMBRYOS TO HEAVY METALS. Harold H. Lee, Biology Department, University of Toledo, Toledo, Ohio, 43606, and Chun-Han Xu, Institute of Oceanography, Qingdao, People's Republic of China.

Metals at different quantities were added to the artificial sea water (ASW) to study fertilization and developmental response of the sea urchin, *Temnopleurus coremanticus* collected from coastal areas of the city of Qingdao, People's Republic of China. The ripe males and females were induced to spawn by injection of KCl. After washing the eggs in ASW, the eggs were fertilized in ASW containing metals. Or, the eggs were fertilized in ASW and the fertilized eggs were transferred to ASW containing metals. Among the metals used, Cu inhibited both fertilization and development. Both Ni and Zn inhibit fertilization but not development. While Zn effected a gastrulation block, Ni effected a pluteus block. Hg had no effect on fertilization but effected a gastrulation block. Other related results will be discussed. (Supported by a grant from the CSCPRC program of the U.S. National Academy of Sciences to HHL in cooperation with the Academia Sinica, PRC.)

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## K. GENETICS AND CELL BIOLOGY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 515

DORIS BECK, PRESIDING

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### 1:30 BUSINESS MEETING

1:45 THE TEMPERATURE RESPONSE RELATIVE TO FOURTH VEIN PRESENCE OF THE  $L_5Y_1$   $ci\ ey^R/ci\ ey^R$  STOCK OF *DROSOPHILA MELANOGASTER* AND THREE SELECTION LINES DERIVED FROM RECONSTITUTED  $L_5Y_1$  STOCKS. Veri L. House and Barbara O'Keefe, Department of Genetics, The Ohio State University, Columbus, Ohio 43210.

The reassembly in homozygous state of second and third chromosomes of  $L_5Y_1$  origin ( $2^1, 3^1$ ) that have been held in homozygous state ( $2^1/2^1; 3^0/2^0$  and  $2^0/2^0; 3^1/3^1$ ) with chromosomes from the zero-penetrant stock,  $L_5Y_0$  ( $2^0/2^0; 3^0/3^0$ ) results in a variety of  $RL_{5Y_1}$  lines intermediate in expression to  $L_5Y_1$  and  $L_5Y_0$ . After approximately 84 generations of selection it has been possible to generate lines with zero penetrance of  $L_4$  loss and lines having penetrance values intermediate between  $L_5Y_1$  and  $L_5Y_0$ . The expression of  $L_5Y_1$  (penetrance in females at  $26^\circ C = 53\%$ ) and three of these lines ( $RL_{5Y_1a_2-3}$ ,  $P^+ = 40.9\%$ ;  $RL_{5Y_1a_3-iso9}$ ,  $P^+ = 22.7\%$ ;  $RL_{5Y_1a_1}$ ,  $P^+ = 0.0\%$ ) has been studied at  $18^\circ C$ ,  $22^\circ C$ ,  $26^\circ C$  and  $30^\circ C$ . Interpreting the distributions relative to  $L_4$  presence as being normal but truncated at either thresholds for minimal (0%) or maximum (100%)  $L_4$  presence, the data can be transformed to a scale of vein presence that extends below and above the minimal and maximal thresholds respectively. When the transformed means are plotted as a function of temperature a non-linear relationship emerges

which is similar to the non-linear curve of correspondence between changes on the genotypic and phenotypic scales relative to different selection lines. The results of the temperature study are compatible with such a non-linear correspondence, with temperature differences replacing modifier differences to effect a traverse of the genotypic scale from low to high potency values.

- 2:00 IN VITRO TESTING OF THE EFFECTS OF EPINEPHRINE ON THE RATE OF FREE FATTY ACID RELEASE IN GENETICALLY OBESE MICE AND THEIR LITTERMATES  
Kimberly A. Oster and Bonnie L. Lamvermeyer, Department of Biology,  
Denison University, Granville, Ohio 43023

Lipolysis normally occurs in adipose tissue after stimulation with the hormone epinephrine. In genetically obese mice, epinephrine seems to have no effect on lipolysis and/or fatty acids are reesterified following release.

Adipocytes in genetically obese mice and their littermates were measured for rates of free fatty acid release after exposure to various epinephrine concentrations. Quantitative relationships between genotype and epinephrine-stimulated free fatty acid release were analyzed by a modification of Nilsson and Belfrage's pH-stat titration technique.

The experimental mice were obtained from the mating of six pairs of commercially available genetically inbred heterozygous obese mice. Obese mice (ob/ob) can be phenotypically identified from their normal littermates (+/+ and ob/+) at approximately one month of age. Their body size increases rapidly, reaching an average maximum weight of 70 grams at 9 months of age. An average maximum weight of 30 grams has been recorded for their normal littermates at 4 months of age. Weekly reports of weight gains and food intake were kept in order to quantify relationships between these factors and the F<sub>1</sub> genotypes. Perirenal and subcutaneous adipose tissues were dissected from the mice. The adipocytes were isolated from these tissues using a revised procedure of Fain's employing the digestion of connective tissue by a Krebs-Ringer-HEPES buffer containing collagenase.

- 2:15 IN VITRO SUB-LETHAL TOXICITY INDICATED BY CHANGES IN CELLULAR ENERGY METABOLITE LEVELS. M. T. Wininger, Monsanto Research Corporation, Dayton, Ohio 45407

Proliferating Chinese hamster ovarian epithelial cells (CHO-K1) were used to investigate the changes in levels of cellular energy metabolites, AMP, ADP, ATP, NAD, and NADH, as indicators of the toxic effects of sub-lethal concentrations of xenobiotics. Toxic chemicals were used to treat cells at lethal and non-lethal concentrations from  $10^{-3}$  to  $10^{-8}$  g/ml. Isotachophoresis was used to analyze for the amounts of the energy metabolites following cell treatment. This electrophoretic technique proved to be a good analytical approach for these labile cellular metabolites, whereby all components were sequentially and quantitatively determined. Significant changes of these metabolite levels were noted at 1/1000 of the lethal dose. This approach to the assessment of the effects of non-lethal concentrations of xenobiotics on mammalian cells could provide for a sensitive biochemical and energy-related indication of cellular toxicity in lieu of total cell death as an endpoint.

- 2:30 METHYL MERCURY INDUCED ALTERATIONS IN ACID PHOSPHATASES ACTIVITIES IN THE INTESTINE OF THE BLUEGILL FISH - LEPOMIS MACROCHIRUS (TELEOSTEI). Amjad Hossain and Hiran M. Dutta. Department of Biological Sciences, Kent State University, Kent, OH 44242.

Histoenzymological investigations were made on the acid phosphatases activities in the intestine (including digestive caecum) of both controlled and methyl mercury ( $3.45763 \times 10^{-12}$ M) exposed bluegill fish. Intestines of three normal and five exposed fish (2 for 24 hrs., 2 for 48 hrs. and 1 for 72 hrs.) were investigated by applying the modified Gomori Lead Method. Regional investigation was done by making sections (10  $\mu$  thick) from four parts of 8-12 cm long intestine and the digestive caecum. Sections from the digestive caecum (both controlled and exposed) indicated very slow acid phosphatases activities. The sections of the intestine close to the stomach in the controlled fish, and the sections from the terminal part of the exposed showed constant higher enzyme intensity, whereas, in the middle parts of the intestine, acid phosphatases did not show a definite pattern of ascending or descending order of activity. Compared to the controlled ones, the enzyme activities were much higher in the exposed fish, occurring in an ascending order of 24 hr. to 72 hrs. of exposure time. It is suggested that the higher synthesis of acid phosphatases in the exposed fish exists to metabolize and detoxify the methyl mercury. The continuous increase in the acid phosphatases activities in the terminal part of the intestine may be due to its direct and constant contact with the methyl mercury in the water. The insignificant activities of acid phosphatases in the caecum of the controlled and exposed bluegill fish may be related to the different structures and functions.

## MATHEMATICS AND COMPUTER SCIENCE

- 2:45 CHANGE IN THE BLOOD SERUM CHOLESTEROL AND ITS RELATION TO THE HDL (HIGH DENSITY LIPOPROTEIN) LEVEL, CAUSED BY THE METHYLMERCURIC CHLORIDE IN BLUEGILLS. Ali Zendedel Haghighi, (Chemistry Department) and Hiran M. Dutta, Department of Biological Sciences, Kent State University, Kent, OH 44242.

The blood serum samples of bluegill fish (*Lepomis macrochirus*), kept in Me-mercuric chloride water ( $8.728 \times 10^{-4}$  ppbx/w), were collected daily for three days. The samples were collected on a random basis to avoid the effect of food on the cholesterol level. The cholesterol concentration in each sample was determined by the Wyleenga's method and changes were found in the fishes exposed to the methyl mercury. The experimental results indicate a decrease in the cholesterol concentration on the second day, and an increase on the third. The level of blood serum HDL was tested in the same fish. A modified Disc Gel Electrophoresis of Naito was used for the separation of lipoprotein fractions of the serum. The result shows that there is an increase in HDL of blood serum on the second day, which is related to the decrease in the cholesterol level because the latter is controlled by the HDL, whereas, the increase in the level of HDL is possibly triggered by the methylmercuric chloride.

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## L. MATHEMATICS AND COMPUTER SCIENCE

MORNING SESSION, SATURDAY, APRIL 23, 1983

MATHEMATICAL SCIENCES BUILDING, ROOM 340

DAVID MERONK, PRESIDING

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- 8:30 TEACHING-LEARNING STRATEGIES FOR TECHNICAL-REASONING SKILLS, by Waldemar C. Weber, Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, Ohio 43403.

Since pattern synthesis skillfully obtains useful hypotheses for reasoning inductively from direct experience while pattern analysis skillfully obtains useful conclusions for reasoning deductively from indirect experience, it becomes possible to alternate between these two modes of technical inquiry by way of the common patterns that are held between them. In either case, various gaming and simulation techniques have been applied to cultivate the required skills. However, the preferred strategy suggested here involves a restructured version of "Eleusis," which developed gradually in several honors seminars and which promises to engage the interest of school children as well as young adults. Although the original version was invented by Robert Abbott and popularized by Martin Gardner to teach inductive reasoning from direct experience, the revised rules tend to provide the desired balance with deductive reasoning from indirect experience. A copy of these rules may be obtained upon request (North American Serial Rights are reserved).

- 9:00 ON FIBONACCI NUMBERS OF SPECIAL FORM. Ray P. Steiner, Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, Ohio 43403.

We give a brief presentation of known results on Fibonacci numbers of special form. This will include a summary of the proofs of which Fibonacci numbers are squares, which Fibonacci numbers are triangular and some new results on which Fibonacci numbers are powers.

- 9:30 APPLICATION OF AN EVENT TYPE MODEL FOR ACID DEPOSITION. S. Mermall and A. Kumar, Department of Civil Engineering, The University of Toledo, Toledo, Ohio 43606.

Acid rain is a public concern and a political issue in North America and Europe. Efforts are being made to develop computer models to estimate the effects of emissions on various receptor points. An improved event type long range transport model has been formulated and programmed. Improvements in the model include incorporation of trajectories obtained from different trajectory analysis schemes and dry deposition velocity as a function of land use, season and atmospheric stability.

The model is used to study: (i) relationship between synoptic conditions and continental concentration of sulfur, (ii) the sensitivity of dry deposition velocity on ground level concentration and (iii) sulfur budget for Ohio, using July 1978 meteorological and emission data. The results obtained from the model show the importance of each variable on acid deposition.

- 10:00 EIGENVALUE ANALYSIS OF THE CALCULATIONS IN X-RAY IMAGE RECONSTRUCTION BY BACKPROJECTION TECHNIQUES. Behrouz Shabestari and James B. Farison, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606.

Filtered backprojection is the primary computational technique for computerized

X-ray tomography and for single photon and positron emission tomography. Backprojection is a geometrically-based technique that provides a first reconstruction of the object by simple calculations on the recorded image data. Among the methods for refining the backprojection are ray-by-ray correction (algebraic reconstruction technique) and simultaneous correction (iterative least-squares technique).

This paper presents several results related to the matrix modeling of the linear operations involved in these correction techniques for the special case of orthogonal image projections. Linear vector space properties of these matrix operators are obtained and interpreted, with example applications. The characteristic equation and the eigenvalues of the iterative  $n^2 \times n^2$  matrix operation in simultaneous correction are derived for an  $n \times n$  object with orthogonal projections. The eigenvalues are 0,  $1/2$  and 1, with multiplicities 1,  $2(n-1)$  and  $(n-1)^2$ , respectively.

- 10:15 STATISTICAL EVALUATION OF THE AKRON CITY POLICE OFFICER DATA. Debbie Vorndran, Isadore Newman & Richard A. Mostardi. Akron City Hospital Physical Fitness Testing Center & The University of Akron, Akron, Ohio

Three-hundred forty officers from the Akron City Police Department volunteered for this study where the main objective was to establish a maximum age requirement for hiring. After a complete medical history and occupation related physical examination, descriptive statistics were done to check the validity of the data. Having collected data for 148 variables, it was necessary to reduce the number of variables using factor analysis, with each category analyzed separately. An Eigen value of one (1) was chosen so that each factor retained accounted for more variance than any variable alone. Using Kaiser factor matching the thirty-three factors were found extremely stable. For each category, the factors from that category were used as independent variables in a regression equation with age as the criterion (dependent) variable. The factors accounting for the most variance in age were chosen by F values and the regression was run again with these factors yielding composite scores (predicted ages) for each category. These six composite scores were standardized and normalized then used as independent variables in a regression equation with age as the criterion. Analyzing the F values showed the cybex composite score and the graded exercise composite score accounting for the most variance. The final regression equation had these two composite scores predicting age yielding a composite of composites which was standardized and normalized then plotted vs. age. In conclusion, a prospective officer would need to score within one standard deviation of the mean of the composite of composites for his/her age.

- 10:30 COMPARISON OF THE METHODS OF FU AND FAHMY FOR FEEDBACK CONTROL SYSTEM DESIGN BY EIGENVALUE SHIFTING. James B. Farison and Domingo L. Uy, Department of Electrical Engineering, The University of Toledo, Toledo, OH 43606.

For the dynamic system  $\dot{x} = Ax + Bu$  with linear feedback  $u = Kx$ , the closed-loop system is  $\dot{x} = (A + BK)x$ . Eigenvalue shifting is a feedback control design technique in which the feedback gains  $K$  are chosen to shift the modes of the open-loop system (eigenvalues of  $A$ ) to the desired closed-loop eigenvalues of  $A + BK$ . Controllability of the system  $(A, B)$  is the necessary and sufficient condition for the existence of  $K$  for arbitrary shifting.

Of the many available approaches to the problem of finding  $K$ , two recent and attractive methods are due to Fu and Fahmy. This paper reviews and compares the two methods as to their conceptual and computational advantages and their applicability.

Fu's method is entirely general, handling any eigenvalue structure for  $A$  including repeated roots (even in multiple chains). Any combination (and not necessarily all) of the eigenvalues of  $A$  can be shifted to any desired values. It is based on the canonical structure of  $A$  which is desirable conceptually. However, for the case of multiple chains with the same eigenvalue, it requires repeated canonical transformations which involve considerable computation.

Fahmy's method will also handle any  $A$ . It is based on the resulting eigenstructure of  $A + BK$ , an advantage in certain cases (such as minimum-time control of discrete-time systems). It requires somewhat less computation than Fu's method. However, unlike Fu's method, it can only be applied when all eigenvalues of  $A$  are being shifted.

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L. MATHEMATICS AND COMPUTER SCIENCE  
 AFTERNOON SESSION, SATURDAY, APRIL 23, 1983  
 BUSINESS ADMINISTRATION BUILDING, ROOM 117  
 DAVID MERONK, PRESIDING

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1:30 BUSINESS MEETING

2:00 THE ROLE OF COMPUTER ASSISTED INSTRUCTION FOR THE MICROCOMPUTER  
Raymond E. Polchow, c/o Muskingum Technical College, Zanesville, OH 43701

The focus of this paper is threefold; to explore the various methodologies of Computer Assisted Instruction (CAI) now available in a learning situation and which can readily function as an extension of the instructor if properly understood and more importantly, properly used, a cursory review of the state of the art and literature of Computer Assisted Instruction, and finally an analysis of this writer's model and subsequent development of a Computer Assisted Instruction courseware system. First, the purpose of the writer was to establish the role of CAI for the microcomputer including the role of the faculty. In addition to a brief overview of CAI strategies and methodologies, the writer explored, on a limited basis, classic learning theory as it related to CAI. Also, implication of CAI as a multi-media, interactive, system was explored as a viable alternative within organizational strategies and computerized course design. The writer's personal interest is one of a concerned faculty in the technical college, with a sincere desire to create the optimum learning environment for tomorrow's technical college student. Therefore, the writer outlined a ten-part problem statement that validated the effectiveness of CAL. Establishing this justified the purpose and relevance to this paper which deals with, perhaps, the greatest technological innovation since the printing press in education. Second, a cursory overview of authoring systems versus programming languages for educational software was explored. The state of the art of courseware was reviewed including the implications for the future, including computer literacy. In addition, courseware concepts and models were interrelated per a review of the literature including instructional system design. Third, introduction of the writer's courseware and subsequent rationale was explored.

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SEE COMPUTER SCIENCE SYMPOSIUM IN SECTION H,  
SCIENCE EDUCATION

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M. PSYCHOLOGY

MORNING SESSION, SATURDAY, APRIL 23, 1983

PSYCHOLOGY BUILDING, ROOM 101

RONALD J. KLEIN, PRESIDING

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8:30 HAIR MINERALS AS PREDICTORS OF LEARNING DISABILITIES. Ronald F. Bobner, Douglas H. Nybell, Louisa Marchionda, Mary Beaubien Youngs-town State University, Youngstown, Ohio 44555; Isadore Newman, The University of Akron, Akron, Ohio 44325.

By definition, learning disabled children in the state of Ohio are defined as having a severe discrepancy between achievement and ability which is not primarily the result of physical handicap, neurological damage or emotional disturbance. These disabilities often prevent the children from participating in regular classroom settings and as a result millions of dollars are spent annually on special education programs for these children. Until recently the primary treatment mode was behavioral. There is increasing evidence, however, that sub-clinical levels of deficiencies or toxicities of certain elements involved with nervous system metabolism may be associated with these disabilities. The current study was designed to test the ability of hair mineral analysis to discriminate between a population (N=96) of learning disabled and non-learning disabled public secondary school students. Fourteen mineral levels were obtained and in addition five mineral ratios thought to be implicated in behavior disorders were calculated. School administrative classification of students and student ratings on the Devereau Behavior rating scale were used as criterions. A discussion of the results will be presented and the practical implications for school teachers/administrators will be discussed.

9:00 EFFECTS OF VICTIM AND DEFENDANT PHYSICAL ATTRACTIVENESS IN JURY SIMULATIONS  
Sallie E. Gordon, Wright State University, Dayton, Ohio 45435.

Results from previous research using simulated trial techniques has shown that jury members are often swayed by the physical attractiveness of the defendant.

In other studies, when the trial involved the crime of rape, characteristics of the victim have been found to affect the perceived guilt of the defendant. The present study directly compared the effects of physical attractiveness of the defendant and of the victim within the context of a robbery trial vs. the context of a rape trial (where physical attractiveness may be more directly relevant to the crime). Subjects were individually presented with a written case study of either a robbery or a rape incident along with pictures of a male defendant and a female victim that had been pre-rated as ranging from very attractive to very unattractive. Subjects were then asked to make several judgments pertaining to the guilt of the defendant, and finally, to rate the defendant and victim on their physical attractiveness. Results showed that for the robbery trial, perceived guilt of the defendant was not affected by attractiveness of either the defendant or the victim. In the rape case, the defendant was less likely to be judged guilty if he was attractive than if he was unattractive. However, the attractiveness of the victim did not affect subject's ratings. The results will be discussed in relationship to previous findings.

9:30 A SYMPOSIUM.  
INTERDISCIPLINARY EFFORTS IN GERONTOLOGY: BOOM OR BUST

Presenters: R. Haude, I. Newman, A.I. Narraway, R. Gandee and R. Deitchman  
Discussant: D. Weis

The University of Akron, Akron, Ohio 44325

The areas of perceptual style as an unexamined variable, assessment problems and solutions, the impact of technological growth on gerontological research, the Senior Olympics and its impact on gerontological research and the question of whether there is a future for interdisciplinary efforts will be the major issues of discussion in this symposium.

10:45 EXERCISE AS A TENSION REDUCTION MECHANISM IN CANCER PATIENTS. Maryl L. Winningham and Mary G. MacVicar. The Ohio State University, Laboratory of Work Physiology, Larkins 129, Columbus, Ohio 43210.

In spite of tremendous advances in the treatment of many kinds of cancer in the past ten years, cancer remains the disease Americans most fear. Extensive research has been done on the emotional distress experienced by cancer patients as they attempt to cope with several common issues: 1) diminished life expectancy 2) the nature of the treatment side effects and 3) the uncertainty of prognosis; however, little is known about how patients attempt to cope with the threat of decreased functional capacity as a result of treatment or disease progression. Regular exercise has been reported to be an effective means of adapting to both perceived stress and maintaining or increasing functional ability. With this in mind, cancer patients who remain physically active were solicited to answer a questionnaire through a letter appearing in nationally-distributed Bicycling magazine. Respondents included over 100 men and women ranging from 15 to 77 years of age with many kinds and stages of cancer. Questionnaire data, as well as comments included in letters, indicated that while some patients had been physically active before the diagnosis of cancer, many individuals started exercising while going through therapy or after therapy. Many patients indicated that they perceived exercise as a stress-controlling mechanism in helping them cope with their disease and maintain a sense of control over their lives as well as a means by which functional capacity could be maintained or enhanced.

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M. PSYCHOLOGY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

PSYCHOLOGY BUILDING, ROOM 101

ROBERT GANDEE, PRESIDING

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1:30 BUSINESS MEETING



- 1:45 CREATIVE ACTION ORIENTED PSYCHOTHERAPY: TECHNIQUES AND APPLICATIONS.  
Presented by Ronald J. Klein, Ph.D., QMRP, Staff Psychologist, Western Reserve Psychiatric Center, P.O. Box 305, Northfield, Oh. 44067.

A number of different techniques and their applications will be explored and demonstrated at the session to assist psychotherapists in facilitating change within their clients/patients. Some of the varied therapeutic maneuvers that will be examined are as follows: the use of role-playing, role-reversal, figurative language, paralinguistic communication, expressing and observing ego functions, and many more. Audience members will be asked to participate in demonstrations.

- 2:30 THE EFFECTS OF THE PRESENCE OF OTHERS ON CHILDREN'S SPEED OF WALK ON BALANCE BEAMS  
Mary Jo MacCracken, The University of Akron, Department of Health and Physical Education, Akron, Ohio 44325

Using both simple and complex balance tasks, this study tested the effects of the presence of others upon children's speed of walk. Young boys and girls with high or low skill level were tested while walking balance beams "alone", in coaction (pairs), and before spectators. Audience conditions affected the sexes differently on complex but not on simple tasks. In the spectator setting only, there was a significant difference in performance between high and low skilled females but not between males. In coaction only, there was a significant difference between high and low skilled males but not females. Thus, on complex balance beam tasks in the spectator setting, where social sensitivity was important, girls were more noticeably affected than boys. High skilled girls evidenced increment whereas low skilled girls demonstrated decrement in speed of performance. But in coaction, with competition and modeling available, high skilled boys demonstrated faster performance than their low skilled counterparts. Further study is necessary to discern the total true effects that an audience or coacting partners have upon skilled and unskilled girls' and boys' motor performance. Until more is known, all children should be given equal opportunities to perform balance tasks in various settings where attention should be given to skill level.

- 3:00 SCHOOL SIZE AS IT RELATES TO SCHOOL CLIMATE. Dr. Dianne Kay Kauffman and Dr. Ronald F. Bobner. 628 Ardleigh Drive, Akron, Ohio 44303 and 1235 E. Main Apt.3, Kent, Ohio 44240.

The purpose of this study was to ascertain the relationship between school size and school effectiveness where effectiveness is operationalized primarily by the climate factors of the Elementary and Secondary School Environment Index (ESI) and secondarily by the median percent ACT score. Emphasis was given to the question: Is school enrollment an indicator of school effectiveness?

An ex post facto design was chosen. The two general hypotheses generated 32 research hypotheses which were tested using multiple linear regression. Alpha was set at .05; power was given for each effect size.

Thirty-two self-selected schools in a 12-county area of northeastern Ohio comprised the data base. The ESI was administered to the students, and principals were surveyed via questionnaire. Significance was obtained when school size was tested against the expressiveness factor of the ESI while other variables were held constant through covariance. School size accounted for 8.68% of the variance in expressiveness. It was concluded that the percentage was too small to advise altering enrollments in order to realize gains in expressiveness.

- 3:15 SPATIAL ABILITY DEVELOPMENT VIA MICROCOMPUTOR  
Marlin Languis, Ohio State University  
202 Arps Hall, 1945 North High Street  
Columbus, Ohio 43210

Spatial thinking represents a major component of intellectual ability and of problem solving. Recent work in spatial abilities reveals three important principles:

1. Spatial abilities may be classified into static dynamic and transformation.
2. Spatial abilities appear to have a cognitive developmental pattern; spatial abilities are malleable and may be increased responsive to training and heuristic practices.

The graphics capability of the modern microcomputer makes it possible to present spatial events in three dimensions and in motion and the student can manipulate the forms on any or all of the X Y and Z axes. Therefore, the microcomputer is a remarkable intellectual prosthesis by which spatial abilities may be assessed and enhanced. The presentation will demonstrate and report the work of the author in using Apple II microcomputer graphics in teaching and assessing spatial abilities in 30 mental rotations.

## JUNIOR ACADEMY

- 3:45 THE RELATIONSHIP OF PRESERVICE TEACHERS' NEURAL PROCESSING, COGNITIVE STYLE AND PERSONALITY TYPE TO CLASSROOM LEARNING AND TEACHING BEHAVIORS  
by Carol Lyons  
The Ohio State University, 202 Arps Hall, 1945 N. High Street, Columbus, Ohio 43210

This study has both a quantitative and qualitative component. The first purpose of the study (quantitative component) was to investigate the relationship between neural functioning dichotomies, cognitive style dichotomies, and personality polarities in order to describe an individual's learning processes. The second purpose (qualitative component) was to document how subjects who have been given the opportunity to learn about learning processes and to investigate and understand their own learning processes attempt to translate that information into more appropriate learning and teaching behaviors.

Twenty female elementary education majors enrolled in a three quarter learning style program of study volunteered for the study. A learning style model, which juxtaposed neural processing dichotomies (assessed by EEG), cognitive style dichotomies (determined by the Rod-and-Frame Test, Concealed Figures Test, and Group Embedded Figures Test), and personality polarities (determined by the Myers Briggs Type Indicator) served as the basis from which these prospective teachers developed insights concerning the information processing strategies they preferred to employ. The results of Pearson Correlation and Multiple Regression revealed significant relationships between the three variables. The qualitative data documented subjects ability to apply cognitive processes information to classroom teaching performance.

- 4:15 DEVELOPMENTAL COMPONENTS OF LEARNING DISABILITY: AN EEG INVESTIGATION OF PATTERNS IN COGNITIVE ORGANIZATION  
by Paul Naour Ph.D.  
The Ohio State University, 202 Arps Hall, 1945 N. High Street, Columbus, Ohio 43210

Four groups of boys (N=24) were identified to have their EEG recorded while they were engaged in five cognitive tasks. Two groups of normal boys (3rd grade and 6th grade) were selected. In addition, two groups of learning disabled boys (3rd grade through 6th grade) were selected on the basis of at least a 10 point deficit in verbal I.Q. as compared to performance I.Q. (W.I.S.C.-R.)

Two channels of EEG were recorded from bipolar electrodes placed at P3-T5 and P4-T6 (according to the International 10-20 system) because of their location in overlaying language association cortex of the left hemisphere and its homologue of the right hemisphere. Fast Fourier Power Spectral analysis was performed on the recorded data. Data was printed out in four second epochs for each 4 cycle/second frequency band (0-4, 4-8, and 8-12) and 12-40 Hz and subjected to ANOVA for group comparisons. The ANOVA revealed significant difference in cognitive organization between groups while engaged in reading and spelling tasks. The 6th grade learning disabled group match and patterns exist by the 3rd grade normal group. The data suggests that developmental trends in cognitive organization is a relevant component in learning disability.

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## N. JUNIOR ACADEMY

MORNING SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 100

JAMES McALEESE, PRESIDING

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- 9:00 TRANSDUCTION OF BACILLUS THURINGIENSIS

Don M. Hilty - Benjamin Logan High School, Zanesfield, Ohio  
Box 98 43360

Transduction is the transfer of a portion of a chromosome from one bacterial cell to another by means of a virus. This is a temperate bacteriophage which carries this genetic material from the donor cell to the recipient cell. This project deals with the changing of the genetic characteristics of Bacillus thuringiensis by transduction with bacteriophages CP-51 and CP-54.

Cotransduction is the genetic transfer of two markers simultaneously. The donor and recipient cells each receive a genetic marker from the other. Thus, both cells gain new genetic characteristics. DNA recombinant work in transduction and in cotransduction may be used to determine the chromosomal map for Bacillus thuringiensis.

- 9:15 THE EFFECT OF L-CANAVANINE ON THE HEMOCYTES OF THE TOBACCO HORNWORM, Manduca sexta.  
Reid W. Prinkey, 2602 Rd. 12 Bellefontaine, OH 43311.

The tobacco hornworm, Manduca sexta, has long been an agricultural pest throughout North and South America. The organism completes its entire life cycle in about one month. During this time, they can cause extensive damage to crops.

L-canavanine is a naturally occurring structural analogue of L-arginine. It is produced by certain legumes such as the jack bean (Canavalia ensiformis), and has been shown to be toxic to some insects. Numerous studies involving the use of canavanine as an insecticide to control the tobacco hornworm have been conducted. Most of these studies are observations of how the chemical affects body weight. Few, if any studies have been done concerning the effect of canavanine on the hemocytes (blood cells) of the hornworm. This project deals specifically with the effects of canavanine on the blood cell differential of the hornworm.

- 9:30 A GENERAL STUDY OF SIDS WITH EMPHASIS ON BRAIN STEM NERVE FIBERS AND A THEORETICAL RECOMMENDATION. Katie A. Titus, 4752 Plattsburg Rd., Springfield, OH 45505.

SIDS, sudden infant death syndrome, is the largest single cause of death in children under 1 year of age. It is responsible for approximately 8,000 deaths a year in the United States and occurs most often at night during the late winter months in infants between the ages of 2 weeks and nine months. SIDS is not contagious nor due to parental neglect. No screening has yet been devised for SIDS but some infants are at risk if certain factors are present such as low birth-weight, low Apgar score, or most of all being a sibling of a prior SIDS victim. In the last 10 years, studies of cardiac tissues, the respiratory system, sleep patterns and other research have resulted in no definite cause or causes. Current findings by researchers at Ohio State University indicate a "maturation lag" could be the problem. Tiny spines along nerve fibers indicate the brain stem might not yet be mature at birth. In line with this hypothesis, high-risk infants could then be treated in the same manner as premature babies. French and American studies have shown that the use of a rhythmically rocking water bed can duplicate the womb's environment. This promotes better growth patterns, decreases the instances of irregular breathing and irregular heartbeats. The water bed would also provide a better and more uniform support for the infant's head and spinal cord. The search for an answer to SIDS continues.

- 9:45 THE INFLUENCE OF PREVAILING WINDS ON TEMPERATURE STABILITY  
Eric E. Wertz, 3529 Dayton Avenue, Kent, Ohio 44240

This research project is concerned with an attempt to determine the influence of prevailing winds on temperature stability, and whether some methods might be developed which would be helpful in forecasting future temperature trends. The major hypothesis used was that cities with prevailing winds off a body of water should have more stable temperatures than those with prevailing winds off land masses. Thus the former should show higher correlation factors, more subtle slopes, and smaller Y-intercepts than the latter.

To secure an adequate data base, 60 foreign countries were contacted for detailed monthly temperature averages for their most prominent coastal cities. A complex TRS-80 computer program was then designed to test the hypothesis. Linear slopes, Y-intercepts, correlation factors and interpolation, and parabolic analysis were used to analyze the data in depth for the months of March, June, September, and December for up to 100 years. Linear and parabolic functions of best fit were determined for 10, 20, 25, 50, and 100 year intervals to insure validity of the hypothesis. Future temperature predictions were also made.

The research showed that 80% of both the linear and parabolic correlation factors were higher for cities with prevailing winds off the water, confirming the hypothesis that such cities have more stable temperatures than those with winds off land masses. Cross-checking of predictions of future temperature trends based on these analyses also indicated a fair degree of validity for the forecasting methods.

- 10:30 THE GROWTH EFFECTS OF L-CANAVANINE CONSUMPTION ON THE EUROPEAN CORN BORER.  
OSTRINIA NUBILALIS. Joe Manor, 8766 Co. Rd. 97; Belle Center, Ohio 43310.

This project deals with the effect of L-canavanine on the Fifth Instar European Corn Borer, Ostrinia nubilalis (Hubner) (Lepidoptera: Pyralidae). L-canavanine, a naturally produced analogue of L-arginine, has been shown to effect the growth devices of the Tobacco Hornworm (Manduca sexta). It has been shown that L-canavanine inhibited the growth while in fifth instar and also inhibited pupation or caused malformed adults. Growth effects included weight loss, irregular molts, and inhibition of size. In this study, corn borers were used in place of tobacco hornworms. The possibility of L-canavanine being used as a control device for the European corn borer will be discussed.

## JUNIOR ACADEMY

10:45 THE INFLUENCE OF HYPERBARIC PRESSURE, VACUUM, AND MIXED GASES ON THE ANTIMICROBIAL ACTIVITY OF PIPERACILLIN. Philip James Winchell. 3840 Schirtzinger Road. Columbus, Ohio. 43220.

This research examines how a recently approved antibiotic, piperacillin, is affected by different combinations of nitrogen, oxygen, helium, and air under elevated pressures. Two bacteria, Escherichia coli and Micrococcus luteus were grown in nutrient agar and the experimental dishes inoculated with piperacillin sensitivity discs. These and control dishes were subjected to seven different mixed gases at four different pressures. The gas mixtures chosen were: air, 20% O<sub>2</sub> - 80% He; 50% O<sub>2</sub> - 50% He; 80% O<sub>2</sub> - 20% He; 20% N<sub>2</sub> - 80% He; 50% N<sub>2</sub> - 50% He; 80% N<sub>2</sub> - 20% He. The pressures selected for the study were: 8 psia, 30 psia, 60 psia, and 120 psia. Equipment included a self-conceived, designed, and constructed hyperbaric pressure chamber capable of exerting a pressure of up to 150 psi. Preliminary results of the 56 trials indicate that although the data collected is diverse, in general the antibiotic tested had a greater effect under hyperbaric conditions. There were substantial differences in piperacillin's antibacterial activity on E. coli, a gram-negative bacteria and M. luteus, a gram-positive bacteria. Growth patterns were much more stable for M. luteus. Positive implications can be applied to hyperbaric medicine and as an adjunct treatment to more conventional methods of therapy.

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## N. JUNIOR ACADEMY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

BUSINESS ADMINISTRATION BUILDING, ROOM 100

JAMES McALEESE, PRESIDING

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### 1:30 BUSINESS MEETING

1:45 THE EFFECT OF RIBONUCLEIC ACID ON THE LEARNING ABILITY OF LUMBRICUS TERRESTRIS. Diane L. Willford. Patrick Henry High School, Hamler, Ohio 43524.

The main purpose of this project was to see if RNA was involved in the storage of memories. This experiment was performed to determine if worms, injected with RNA, from a trained worm to an untrained worm would be able to master the T-maze with a fewer number of trials than the worm that had no injection of RNA. Therefore, the rate at which the worm could learn was of main interest. In this experiment, Lumbricus terrestris were used to demonstrate that classical and operant conditioning can be learned by organisms with complex nervous systems. Each worm was placed into the T-maze five times a day until seven consecutive positive trials were completed by the worm. Twelve worms were trained in the T-maze for the extraction of RNA. After the extraction process was done, the RNA was used in injecting the next set of worms. The results of this experiment seem to indicate that the worms, which RNA was injected, learned faster than those worms that did not have RNA injected in them.

2:00 CONSTRUCTION AND EXPANSION OF A MICROCOMPUTER, Terry Walter, 49593 West Bursley Road, Wellington, Ohio 44090

Microcomputers have replaced most of the original prototypes due to the fact that the size and power requirements have resulted in the development of the microcomputer system. The use of IC's (integrated circuits), commonly termed chips, can reduce the size and power requirements of the central processing unit. One chip, postage stamp size, can replace a multitude of components such as vacuum tubes, relays, and memory cores.

While space and power reduction will expand functional usage of the system through the utilization of IC's, they generally result in compromising capacity and function, though the demand for increased efficiency of these parameters continues to increase.

Experimental evaluations are conducted in order to develop an optimum CPU (central processing unit) system which will function beyond the present limitations of manufacturers' models.

Several popular designs are examined for performance limitations of the following variables: expanded memory systems, analog switches, indicators, I/O ports, multiple timer functions, interfaces, and program capacities. Though some recent data is not accessible to the student researcher due to market competition in this field, improved engineering designs can still be developed.

2:15 THE APPEAL OF COLOR TO THE OPPOSITE SEX IN DIFFERENT AGE LEVELS.  
 Laura Derikito, 44640 New London-Eastern Road, Sullivan, OH 44880

In this experiment I set out to determine which color was most attractive to the opposite sex in different age levels. A random sampling of each age level from fifth grade to college level was taken. The participants were randomly chosen and given various pictures of the same person in various colored clothing (red, blue, black, white, pink,...) and were told to choose the most appealing color and to give the reason they chose that particular color. Questionnaires were then given to each participant to determine the persons attitude towards the color that the opposite sex wears under various circumstances and to determine the correlation between parental relationships and their color choice. In most cases the men tended towards different colors under different circumstances while women generally preferred the same general colors. The younger children linked the color with parental influence while the older children generally chose a color that showed less parental influence. Men generally associated white with females, while women generally associated blue with men.

2:30 MIGRAINE AND OTHER HEADACHES

Kimberly Wilson, 1123 Garfield Ave.  
 Springfield, Ohio 45504

My report starts with a discussion of headaches in general. This will include psychogenic headaches such as the tension and neurotic types. I will also discuss vascular headaches which include cluster, hypertension and most importantly, migraine headaches. Finally I will deal with the headaches in the miscellaneous category. The rest of my report deals with the five types of migraine. I will elaborate on each during the actual report.

I will next explain the three major theories about a migraine's origin. Many physicians claim they are caused by either the swelling or constricting of blood vessels. Some doctors say certain substances such as MSG cause migraines. While others claim a body chemical called serotonin causes the changes in brain blood vessels.

The next part of my report deals with the many treatments available to migraine sufferers. There are two types of treatments; medical and non-medical. Medical treatments are analgesics, vaso-constricting agents or preventive medications. There are many long-term therapies which could greatly reduce headache pain such as biofeedback, which I will explain at length during my presentation.

I also surveyed migraine sufferers to test my sources of information. In addition, I surveyed grade school students to test their knowledge of headaches.

2:45 EVALUATION OF A HIGH PERFORMANCE SOLAR COLLECTOR SYSTEM, James McAleese,  
 47149 Bursley Road, Wellington, Ohio 44090

A high performance solar collector system is developed. In general, the system is a sun-tracking configuration. The components of the system are individually evaluated experimentally over a range of variables and parameters; the data is curve fitted using the least squares approximation and the design trends are determined. A computer analysis is then employed to conduct sensitivity and tradeoff studies to yield the optimum system design. The experimental evaluation includes collector tube shielding effects, together with parabolic collector rim angle and flux profile dependent upon sun tracking accuracy, rim angle, reflector surface error and target placement error.

3:00 THE CAVENDISH EXPERIMENT. David Berks, 5930 Withrow Way, Dayton, Ohio 45415.

My experiment replicates Henry Cavendish's experiment, done in 1798, which proved two masses have a constant attraction. I suspended a thin steel wire from the ceiling. Attached to the wire was a sixty centimeter one-eighth-inch beam. To the beam, I attached two one-hundred-gram weights, three centimeters from the wire. Using a stop watch, I found my torsional enertia of the wire. I placed a long piece of paper and drew both a straight line and a point on the paper under the bar. I set the line parallel with the beam. I placed a one-thousand-gram weight next to the twenty gram weight. The beam twisted towards the one-thousand-gram weight. I placed a point where it moved and drew my line. I measured the distance and started my calculations, finding the angle, torsional enertia and moment of enertia. I put these figures into the formula  $F = G \frac{m_1 m_2}{r^2}$ . I found G to be  $7 \times 10^{-11}$ ; the actual value is  $6.67 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ sec}^{-2}$ . With this number I could find the mass of the earth. This experiment opened our eyes to a whole new perspective of the Universe.

3:30 THE EFFECT OF CENTRIFUGAL CASTING. D. Scott Gregory, 4707 Kingsley Circle West Sandusky, Ohio 44870

Centrifugal casting is a method in which a cylindrical mold is spun, forcing the molten metal to the inside of the mold to solidify radially, resulting in many unique properties.

Conventional static casting processes result in a number of metallurgical deficiencies: Non-uniform crystal size resulting in structural weakness, crystal orientation resulting in planar fracture tendencies, temperature variations during crystallization, incorporation of refractory sand and contaminating gasses, and microscopic structural defects formed during crystallization.

Centrifugal casting processes result in uniform crystal size, radial fracture tendencies, reduction of microscopic defects, and minimal incorporation of refractory sand and contaminating gasses. Centrifugal casting processes have industrial applications in the production of compression rollers and high pressure pipe stock.

3:45 TANTALIZING TITAN. Sean P. O'Brien, 3801 Lujon Drive, Dayton, Ohio 45431

The name Titan means the race of giants vanquished by the Olympians in Greek mythology. Titan, discovered in 1655 by Christaan Huygens, is 5150 km in diameter.

This planet-sized body orbits Saturn in sixteen days at a distance of 1,221,600 km.

Titan's mass is  $1,345.7 \times 10^{23}$ g, and its density is 1.9 g/cm, in between that of an icy or rocky body.

The atmosphere is 1.5 bars atmospheric pressure at the surface and is composed of 85% nitrogen, 12% argon, and 3% hydrocarbons. The smog in the atmosphere is caused by successive photochemical reactions on methane and its products to form mostly polyacetylenes which condense onto micron-sized dust particles. The reddish tinge of the atmosphere is caused by photochemical reactions on hydrogen cyanide to form polycyanides, as shown by an experiment by Carl Sagan and B.N. Khrae in 1981. A methane cycle much like Earth's water cycle replenishes the atmosphere. There is weather caused by seasons and a haze above the atmosphere. The atmosphere has radically changed from the original atmosphere of water, ammonia, and methane. The inside of Titan is made up of a hydrocarbon sludge crust, an icy mantle, and a non-magnetic, rocky core.

Titan orbits in its own hydrogen torus. It has a sizable effect on Saturn's magnetosphere and two fellow satellites, Hyperion and Rhea. Eugene Shoemaker, who forwarded a theory explaining Titan's formation, said the other present moons accreted from the debris of Titan's contemporaries destroyed by planetesimals.

4:00 PATTERN DISCRIMINATION AND THE EFFECT OF PARTIAL REINFORCEMENT ON EXTINCTION IN RATS. Erika Dorsey, 1009 Plymouth Ave., Piqua, OH 45356.

The paper concerns an experiment that was conducted with eight laboratory rats to test their ability to discriminate patterns, and to determine what effect partial reinforcement would have upon their resistance to behavioral extinction. It described the apparatus used as one modelled after the Lashley "jumping-stand." The stand utilized two different patterns, one serving as a positive stimulus and the other as a negative stimulus. Food served as a reinforcer. Also described are the adaptation procedures and the pretraining techniques, such as handling the subjects to gentle them, and the use of a deprivation schedule. The rats were divided into two groups; members of one group received 100% reinforcement for all correct responses, while the other group was reinforced only 50% of the time. Discrimination training is outlined in which all the subjects were able to discriminate the two patterns after four days. Once the subjects executed 20 consecutive errorless trials, extinction trials were conducted and results for the two groups compared. The group that received 100% reinforcement achieved the criterion for extinction four times more quickly than the group that received partial reinforcement. Clearly, partial reinforcement had a significant effect on the one group's resistance to extinction.

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## 0. ENGINEERING

### PAPERS PRESENTED IN SECTION E -- PHYSICS AND ASTRONOMY

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P. ADMINISTRATIVE SCIENCES AND PLANNING

MORNING SESSION, SATURDAY, APRIL 23, 1983

MATHEMATICAL SCIENCES BUILDING, ROOM 330

EDGAR ROSE, PRESIDING

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- 8:45 FOCUS ON HUMAN SERVICE PRIORITIES AND PROGRAM EFFECTIVENESS: LEVELS OF SYSTEM EVALUATION. Anne F. Terrill, Ph.D.; Executive Director; Metropolitan Human Services Commission; 55 West State Street; Akron, OH 44308.

The Metropolitan Human Services Commission (MHSC) of Summit County, Ohio, conceived in 1978, and operational in 1981, was designed to coordinate the planning for human services across the public and the private sector.

With significant federal, state and local shortfalls in funding, community businesses and government are increasing the press for more accountability in the expenditure of scarce resources.

MHSC has designed a planning process whereby community needs and services available are identified. Community priorities are broadly formulated and the comparative effectiveness of programs may be assessed. The present paper deals primarily with a methodology for evaluating human service programs which involves consideration of five functional areas within agencies: organization, programming, staff, finances and facilities. Key variables for decision-making are identified.

- 9:15 PUBLIC PARTICIPATION COORDINATION-A TRAINING PROGRAM  
Bernard J. Lukco  
139 W. Elm St.  
Granville, Ohio 43023

A monograph was produced for the US Environmental Protection Agency by the Ohio State University to train public participation coordinators. Its major purpose is to examine the processes and methods involved with citizen participation in planning and decision-making. The assumption is that citizens have both the right and responsibility to be concerned with and active in governmental decisions, without being manipulated or coerced. Information is presented to assist readers in choosing appropriate methods and increased understanding of procedures. Subjects include an overview of planning, information dissemination principles, methods of transferring technical information, use of the media and group interaction techniques. Case studies and available resources are listed. One of the authors will discuss the monograph and its uses as a training tool.

- 9:45 A FEASIBILITY STUDY OF THE USE OF GRADUATE STUDENTS IN CONDUCTING APPLIED SURVEY RESEARCH PROJECTS. Peter J. Leahy and Steven Koven, Dept. of Urban Studies, University of Akron, Akron, Ohio 44325

A number of practical and ethical questions surround the utilization of graduate students in applied survey research. Both negative and positive externalities are associated with the use of students in applied survey research. Negatively, student utilization possesses: 1) the possibility of exploitation of nonpaid workers; 2) the possibility of sloppy or non-professional work; and 3) the possibility of reductions in students' overall learning due to emphasis on nonchallenging, repetitive tasks. Positively, use of graduate students may result in: 1) higher income for cash pressed universities; 2) lower costs for public agencies seeking data; and 3) practical experience for students.

This paper describes a Health Need Assessment study of the City of Akron conducted on behalf of the Health Department during the fall of 1982 by two graduate (urban studies) research methods classes. Six hundred random telephone interviews were conducted over a four week period using the Waksburg modification of random digit dialing. The feasibility of using graduate students to do this type of research is examined in regard to: 1) the validity of the sample and the sample design; 2) the validity of information obtained; and 3) the overall costs and benefits of using graduate student labor to the community, the Health Department, the University and the students themselves. We conclude that projects of this type can be validly conducted on behalf of governmental and social service agencies by graduate students, but we make specific recommendations for others considering such ventures.

10:15 FIEDLER'S CONTINGENCY THEORY OF LEADERSHIP: A TEST ON THE SECONDARY SCHOOLS OF OHIO. Ronald F. Bobner, Youngstown State University, Youngstown, Ohio 44555; Isadore Newman, The University of Akron, Akron, Ohio 44325.

Fiedler's "Contingency Model" of leadership effectiveness postulates that the effectiveness of a group is contingent upon the relationship between leadership style and the degree to which the situation enables the leader to exert influence. This investigation attempted to explore the usefulness of the theory as a guide to the study of principal leadership in public secondary schools in Ohio. Situation favorableness was calculated by obtaining measures of leader-member relations, task structure, and position power. Each of these measures was dichotomized. This results in a total of eight possible situation favorableness Octants. The 32 schools in this classified into Octants I, III, V, and VII. Leadership style was measured by Fiedler's Least Preferred Coworker and leadership effectiveness was the student body taking the ACT. Correlations between leadership style and leadership effectiveness were calculated and compared to Fiedler's predicted values. Some support for Fiedler's Contingency Theory was found.

## P. ADMINISTRATIVE SCIENCES AND PLANNING

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

MATHEMATICAL SCIENCES BUILDING, ROOM 330

WILLIAM BUCZKO, PRESIDING

1:30 BUSINESS MEETING

2:00 THE ORIGINS OF INTER-CITY BUS REGULATION IN OHIO AND ITS CURRENT POLICY IMPLICATIONS, by Janet C. Young and Douglas V. Shaw, Department of Urban Studies, University of Akron, Akron, Ohio 44325

When inter-city bus service began in Ohio, in the years after 1915, service was fragmented and supplied primarily by independent operators with one or two buses. Cities supplied ineffective regulation only within their borders and the industry was characterized by transiency and scheduling chaos. In 1923 the legislature passed the Freeman-Collister Act which required carriers to obtain certificates of convenience and necessity and to purchase insurance. Motor carriers were placed under the jurisdiction of the Public Utilities Commission of Ohio, as they remain today. As certificates were granted to only one carrier on a route, each route became an effective monopoly. This paper will explore the original regulatory movement and how Greyhound Lines manipulated this system to acquire a near-monopoly throughout the state. A reaction to the perceived inequities resulting from this situation led to a 1982 revision of the law, strongly supported by Trailways, allowing limited competition on inter-city routes. The paper will conclude with a discussion of this legislation and its effect on the regulatory environment.

## Q. ECONOMICS

MORNING SESSION, FRIDAY, APRIL 22, 1983

McFALL CENTER GALLERY

H.J. EICHEL, PRESIDING

### COLLOQUIUM

"IMPACT OF THE INCREASING SERVICE/MANUFACTURING RATIO"

8:30

WELCOME AND OPENING REMARKS

DR. HERMAN J. EICHEL



- 8:40 THE ECONOMIC AND SOCIAL IMPACTS OF THE TRANSITION FROM THE INDUSTRIAL SOCIETY TO A COMPUTER LITERATE, HIGH TECHNOLOGY, INFORMATION SOCIETY. Warren H. Groff, Ed.D., VP for Academic Affairs, North Central Technical College, P. O. Box 698, Mansfield, OH 44901.

During recent years we have experienced the onset of a transformation to a new type of society. This transformation to the information society is concerned with the shift from physical productivity of material goods to information productivity and can be expected to bring about fundamental changes in human values, in trends of thought, and in the political and economic structures of society. This learning and information society will be characterized as interactions between people and ideas and knowledge.

This paper will examine the economic and social implications of moving toward a society where "The Paperless Office" and "The Factory of the Future" become a reality and the role postsecondary education can play in that process.

- 9:20 IMPLICATIONS FOR TRAINING AND DEVELOPMENT OF A SERVICE-BASED ECONOMY. Judith B. Kerman, Ph.D., Kent State Univ., Kent, Ohio 44242.

The development of services as major aspects of products, and of new "service products" themselves, has combined with the impact of decentralized information processing to create a new set of training needs with profound long-term implications for the structure and function of business organizations. With the increasing importance of service industries in the U.S. economy, the emphasis in training programs has shifted from task training based on the assembly line model (in both blue and white-collar jobs) to organization development, involvement in product improvement and decision-making. The implications of the new service industries affect reward structures, work styles, educational and personality requirements for employment, and career paths for the individual employee. They have created new directions in training & development in order to train employees for these changes, and help managers monitor, control and assist in the growth of organizations unlike those of the past in politics, structure or information flow.

- 9:50 THE ECONOMIC IMPACT OF THE GROWTH OF THE SERVICE SECTOR IN THE NORTH CENTRAL REGION. V.N. Krishnan and Charles R. Chittle, Department of Economics, Bowling Green State University, Bowling Green, Ohio 43403.

This paper studies the growth of employment and output in the service sector in selected states in the U.S. in the north central region relative to a similar growth at the national level. The aim is to assess the impact of service sector growth on the growth of per capita income and the rate of unemployment in the region compared to the national average. Additionally the effect of the growth of the service sector on the stability of the gross national product of the region is examined. The least square method of regression is used to analyze existing trends and make future projections with a view to assessing the overall economic impact of the growth of the service sector at the regional level relative to the nation as a whole.

The authors suggest that the findings of this study would be useful in providing further empirical support in influencing the debate on employment and growth policies in the region.

- 10:20 THE IMPACT OF LOCATION AND COMMUNITY CHARACTERISTICS ON ECONOMIC SPECIALIZATION IN THE NORTH CENTRAL REGION OF THE UNITED STATES. Leroy J. Hushak and Agyapong B. Gyekye. The Ohio Agricultural R&D Ctr., Ohio State University, Columbus, OH 43210.

In this study, the relationship between economic specialization and location and community characteristics is analyzed for counties of the North Central states for 1970. All counties were categorized into one of six economic specializations: Agriculture, Manufacturing, Manufacturing/Other, Agriculture/Other, Nonagricultural/Nonmanufacturing, and No Specialty. Other includes one or more of construction; transportation, communication and utilities; finance, insurance and real estate; services; or trade.

Based on the results of a discriminant analysis, agricultural counties were found to be low-income and non-urban, while manufacturing counties were found to be high income and less populated. Counties with a manufacturing/other specialty were found to be more urbanized and highly accessible while nonagricultural/nonmanufacturing counties were found to have relatively large potential labor force.

10:50 THE IMPACT OF THE INCREASING SERVICE-MANUFACTURING INDUSTRIES RATIO ON INCOME: THE DAYTON EXPERIENCE. John E. Weiler, Prof. of Economics, University of Dayton, 300 College Park, Dayton, OH 45469-0001.

Between 1969 and 1982, the ratio of non-manufacturing to manufacturing employment in the Dayton area rose from 1.51 to 2.84. This paper will examine the factors which have produced such a change, giving particular emphasis to the relative labor costs in manufacturing and service industries.

In 1972, median household income in Dayton ranked second among Ohio cities. In 1980, Dayton's relative position had fallen to sixth. The relationship between the changing employment ratio and relative income will be examined. This analysis will compare the Dayton results with those in other Ohio cities.

Finally, there will be an attempt to relate changes in median income to future economic activity. Of particular importance is the impact on businesses which serve the local market.

11:20 THE CHANGING SERVICE/MANUFACTURING RATIO AS IT AFFECTS THE LABOR FORCE PARTICIPATION OF WOMEN. Janet C. Goulet, Ph.D., Wittenberg University; Robin L. Bartlett, Denison University. Wittenberg University, P.O. Box 720, Springfield, OH 45501

The largest share of employment growth throughout this century has been in the services producing section. This sector's share of nonagricultural employment has increased from 53% in 1920 to over 70% in 1980. Business and health services accounted for almost half of the increase in services employment since 1972. Workers in the service divisions are more likely to be employed part-time or self-employed. Women account for 60% of the work-force in the service sector.

This paper examines recent employment and wage patterns in the service occupation by sex. Aggregate statistics are collected from major government documents such as Current Population Reports, Consumer Income, Series P-60 and Employment Earnings.

Preliminary findings suggest that white women are once again being drawn and pushed into the labor market, their entry in service related occupations has been matched by that of men. The result of a higher concentration of male and female workers in services has not driven down the relative wages of women even though their sex segregation within the occupation has increased. Reasons for these phenomena are discussed.

11:35 GROWTH OF SERVICE INDUSTRY, ITS EFFECTS ON IMPORTS AND NATIONAL DEFENSE EXPENDITURES. Nguyen T. Quan, Dept. of Economics, Case Western Reserve University, Cleveland, OH 44106.

The purpose of this paper is to investigate the impact of the growth of service industry on the labor force participation rate of women in general, and women 35 years old and above in particular. The paper also attempts to reconcile the joint increase in employment and earnings of men and women in service industry and the surge of foreign manufactured consumer durables. The author hypothesizes that the increase in income and concomitant consumption expenditures can only be satisfied by imports as employment in the manufacturing sector declines. The natural extension of the latter effect is the formation of bottlenecks and subsequent high costs in the production of commodities destined for the national defense since national security criteria dictate that components must be domestically fabricated.

12:00 LUNCHEON

ALUMNI ROOM, STUDENT UNION

1:00 EXPECTATIONS ABOUT PRODUCTIVITY GAINS IN SERVICE INDUSTRIES. Linda Bricker, Raymond Walters College, University of Cincinnati, Cincinnati, Ohio 45236, Ralph Lenz, University of Dayton Research Institute, Dayton, Ohio 45469.

Research we completed last spring indicated that long-run productivity is correlated with market demand. Traditionally, productivity has been linked to capital formation and technological advancement. Our research adds long-run market demand as a determinant of productivity. The data suggests the greatest gains in productivity during the past 10 years have been in industries facing growing markets. The notable exception to our premise was the service sector.

## ECONOMICS

U.S. policy has attempted in the past to improve productivity by favorable tax policies encouraging capital investments. We believe significant increases in productivity are not a likely result of capital investment if demand is not growing nor are additional jobs likely. As a corollary, any increases in productivity which are not accompanied by market expansion will result in fewer rather than more jobs.

Our intent in the paper for the Economics Section of the Ohio Academy of Science is to focus on the exception to our research--the service sector. We will project productivity growth in the service sector. Additionally, we will be appraising the success that can be expected from government policies aimed at improving productivity.

1:30 ASSESSING RESOURCES FOR HIGH TECHNOLOGY. Dr. Ivan G. Kurtz, Provost; Owens Technical College; Caller No. 10,000; Toledo, OH 43699.

A survey project using the Delphi Technique identifies the implementation of high tech equipment in a local metropolitan area manufacturing sector. A review of the literature includes national and local statistics on the employment shift from the manufacturing to the non-manufacturing sector and the predicted utilization and implementation of computer-integrated manufacturing (CIM) processes. Survey results report type of high tech equipment currently implemented, predicted annual increase of equipment in the local industrial community to 1987, and each responding firms' estimate of its own internal implementation of CIM. Skill requirements necessary to support the anticipated growth in high tech equipment are identified and predictions made on the level of difficulty in finding skilled manpower both at the current level of high tech requirements and expected by 1987. The paper reporting this project proposes specific recommendations to the local Private Industry Council for implementation which will provide adequate support services required for the level of high technology expected in the manufacturing sector by 1987. An additional contribution of this report is that the process used in the project provides a model for local communities to utilize that will assist community decision makers in considering steps to be taken that support the growth of high tech firms.

2:00 ROUND TABLE DISCUSSION

DISCUSSANT: DR. JOHN BLAIR

2:50 OVERVIEW AND CLOSING REMARKS

DR. HERMAN J. EICHEL

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## Q. ECONOMICS

MORNING SESSION, SATURDAY, APRIL 23, 1983

PSYCHOLOGY BUILDING, ROOM 102

H.J. EICHEL, PRESIDING

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9:00 OUTLOOK FOR HIGHER EDUCATION IN OHIO

Rajindar K. Koshal, Manjulika Koshal, and Richard K. Vedder  
Ohio University, Athens, Ohio 45701

"Bigger and better" has long been the motto of progress in America, and by these standards higher education has been a resounding success. During the last three decades enrollments at colleges and universities have climbed to record levels.

A review of recent socio-economic factors suggests that the growth in enrollment participation rates during the last 30 years has been rather uneven. This further indicates that the basic assumption of a smooth upward trend in enrollment participation rates assumed in many of the previous studies should be questioned. Accordingly this study examines two approaches to forecast higher education enrollment. First this study proposes an econometric model in which fluctuations in EPR are explained in terms of socio-economic variables.

Specifically, in this study the EPR is assumed to be a linear function of (i) the median family income, Ym, (ii) the unemployment rate of 18-26 year olds, UN, and, (iii) the average family size, S. Using data for the State of Ohio for the 31 years 1951-81, this econometric model is estimated.

Statistical results are interesting and suggests that in the recent years a high unemployment rate has contributed to the growth in enrollment. The future of higher education depends on the state of the economy and the family size in the state.

## 9:45 USING MICROCOMPUTERS IN THE PRINCIPLES OF ECONOMICS COURSE

Susan R. Robinson and Richard A. Schladen, College of Mt. St. Joseph,  
Mt. St. Joseph, Ohio 45051

With the advent of inexpensive microcomputer systems, it has become possible to utilize innovative computer techniques in the Principles of Economics course.

This presentation explores the potential benefits of using microcomputer software in teaching introductory Economics at the under graduate level. It focuses on the use of graphics programs, tutorials and simulations as supplements to the traditional course. Alternative hardware systems are analyzed with respect to capability and software portability. Sources of software are discussed and sample original programs, including macro and micro materials, are presented.

## 10:30 BUSINESS MEETING

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### R. ECOLOGY

FIRST MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 335

RALPH E. J. BOERNER, PRESIDING

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## 8:30 ARCTIC TUNDRA RESPONSES TO ROAD CONSTRUCTION AND ROAD DUST.

Peter D. Spatt, Dept. of Botany, Ohio State Univ., Columbus, OH 43210

Effects of gravel roads and road dust upon tundra soils and plant communities, particularly moss assemblages, were examined in arctic Alaska as part of a larger study investigating effects of development of arctic areas upon biota. Acidic soils adjacent to gravel roads, in comparison to control areas, exhibited greater concentrations of mineral cations (in particular, calcium; 27 meq/100 g compared to 10), lowered levels of extractable hydrogen ions (26 meq/100 g compared to 106), lowered organic carbon (15% compared to 40%), and greater depth of thaw (48 cm compared to 41). Enzymological studies showed altered phosphatase and cellulase activity. Graminoid cover (Carex and Eriophorum) in tundra adjacent to roads was greater than in control areas. Acidophilic mosses, in particular Sphagnum spp., were replaced by graminoids and "weedy" bryophytes (Polytrichum, Aulacomnium). These effects were restricted to a narrow band extending 10-15 m from the road. Road dust, thermal properties of the road, and altered hydrological patterns were thought to contribute to these effects.

## 8:45 NUTRIENT USE EFFICIENCY OF FOREST STANDS ALONG A GRADIENT OF SOIL NUTRIENT AVAILABILITY IN THE HOCKING HILLS. Ralph E.J. Boerner. Department of Botany, Ohio State University, Columbus, Ohio 43210

Valley watersheds in the Hocking Hills are not only mosaics of forest types and microclimates, but of soil types and fertility as well. The soils of Neotoma Valley, Hocking County, constitute a gradient of fertility along which pH varies from 3.9-5.2, phosphorous availability varies sixfold, nitrogen availability varies threefold, and base saturation varies twelvefold. To determine if forest stands on the less fertile soils are

more efficient at nutrient use, foliar nutrient levels, foliar mass, rates of leaching from live foliage, and nutrient resorption were examined in two stands on nutrient-poor soils and two stands on fertile soils. Foliar levels of nitrogen, phosphorous and calcium were consistently higher on the fertile soils. Since leaf masses were similar among the four sites, the stands on nutrient-poor soils were able to produce more leaf area/unit nutrient uptake. Nutrient losses in throughfall and litterfall were higher on fertile soils while proportional nutrient resorption was higher on infertile soils. Thus forest stands on relatively infertile soils demonstrated higher nutrient use efficiency than those on fertile soils. The relationship of these stand level patterns to selection for nutrient use efficiency within species, and to stand composition, will be discussed.

- 9:00 THE ROLE OF CANOPY TREES IN THE FORMATION OF MICROHABITATS FOR HERB GROWTH AND REPRODUCTIVE SUCCESS. Carl R. Crozier and Ralph E.J. Boerner, Department of Botany, The Ohio State University, Columbus, Ohio 43210.

A mixed mesophytic forest stand in Neotoma Valley, Hocking Co., Ohio with a low frequency of rock outcrops, treefalls, and pit/mound topography was examined to determine the role of canopy trees in the formation and maintenance of different herb microhabitats as well as to demonstrate the role of microhabitat differences in structuring understory herb communities. We hypothesized that different herb microhabitats would be determined by one or more of the following environmental parameters: light intensity, litter depth, soil moisture, or soil nutrients. Environmental parameters were examined by sampling around canopy tree bases of the following species: Acer rubrumL., Betula lentaL., Fagus grandifoliaEhrh., Liriodendron tulipiferaL., Prunus serotinaEhrh., Quercus albaL., and Q. borealisMichx.; as well as from plots 2m from any canopy tree. Plots near different tree species were found to differ significantly, in many cases, in levels of the environmental parameters. Stemflow was collected from canopy individuals of the dominant tree species; analyzed for the same nutrients as the soils; and compared to soil moisture and nutrient levels. Mapping of herbs around the different canopy tree species was done in spring, 1981 by recording the # of shoots of all species present; and in spring, 1982 by recording the #shoots, #flowering shoots, #fruiting shoots, and #fruits of Anemoneella thalictroides(L.)Spach., Geranium maculatumL., Polygonatum biflorum(Walt.)Ell., Trillium grandiflorum(Michx.)Salisb., and Uvularia grandifloraSm. Herb distribution patterns and environmental parameter levels were related by comparative ordination and stepwise regression techniques.

- 9:15 ARTHROPOD COMMUNITY STRUCTURE ON STRIP-MINED LANDS IN OHIO, Richard P. Urbanek and Theodore A. Bookhout, Ohio Cooperative Wildlife Research Unit, The Ohio State University, Columbus, Ohio 43210

During 1978-79, biomass, density, diversity, and taxonomic composition of above-ground, non-acarine arthropods were studied on newly reclaimed areas planted to grass-legumes (1-4 years after reclamation), older mined lands planted to crown vetch (Coronilla varia), and unmined old field habitat in Harrison County, Ohio. The arthropod samples examined (N=330) were collected with a 0.5-m<sup>2</sup> quick-trap and D-vac suction sampler. In the herbaceous layer, newly reclaimed areas had highest annual arthropod densities (1,062.5 individuals/m<sup>2</sup>) and biomass (553.6 mg/m<sup>2</sup>). Larvae of alfalfa weevil (Hypera postica) were major contributors to arthropod density in the herbaceous layer during spring 1978, accounting for 47.4% of individuals on the area examined 1 year after reclamation. During September, grasshoppers (Acrididae) accounted for up to 70% of arthropod biomass in the herbaceous layer on newly reclaimed areas. A significant decline in arthropod biomass from 1 to 2 years after reclamation was associated with a decline in yellow sweet clover (Melilotus officinalis) and red clover (Trifolium pratense). The crown vetch area supported lowest numbers and biomass of arthropods in the herbaceous layer. The unmined old field was generally richer in arthropod taxa (48.0% more morphotypes, 32.2% more families per sampling period) than the mined sites. Stable arthropod communities were related to stable plant communities. Arthropod communities on newly reclaimed areas were least stable; annual turnover at family level was 49.1% compared to 4.6% for older mined areas and 15.7% for the unmined old field.

- 9:30 POST DISPERSAL MOVEMENTS BY ANTS OF SEEDS FROM A NEOTROPICAL FIG, Ficus hondurensis (Moraceae). J. Timmons Roberts\*, E. Raymond Heithaus\*, and Adelaida Chaverri. \*Dept. of Biology, Kenyon College, Gambier, Ohio 43022.

We studied the movements of vertebrate-dispersed seeds after their initial dispersal. Our experiments utilized the seeds of the tropical tree Ficus hondurensis (Moraceae) in Parque Nacional Santa Rosa, Guanacaste Province, Costa Rica. The purpose of the study was to (a) assess the factors affecting the disappearance of these seeds, (b) determine whether insects or vertebrates are responsible, and (c) attempt to determine if this disappearance is further dispersal, predation, or some combination of the two.

Of 13,700 seeds placed randomly on the ground in 274 groups of 50 per depot, from 25.2% to 97.7% had disappeared within 24 hours, depending on seed condition and whether

placed under the fruiting tree or in a nearby forest site. Using vertebrate exclosures it was seen that insects could account for 97.7% of removal of seeds. Insects located and removed cleaned Ficus hondurensis seeds more rapidly than seeds from vertebrate scat. Experimental depots were located and depleted more rapidly in a nearby forest site than under the fruiting tree. Six species of ants were the only insects observed removing seeds, Pheidole radoszkowskii accounted for 68 of the 82 observed depot depletions. In experiments in which seeds were presented to nests of different ant species there was variation in treatment of the seeds by seed condition and by ant species. Viable Ficus seeds were found in ant nest refuse piles indicating they are not necessarily seed predators.

- 9:45 MICROHABITAT SELECTION OF THE WHITE-FOOTED MOUSE (PEROMYSCUS LEUCOPUS) IN AN ISOLATED OAK-HICKORY WOODLOT. Loisirene Blumberg and Stephen H. Vessey, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Previous studies of habitat selection in rodents have emphasized vegetational features related to the presence or absence of different rodent species. We used multivariate statistical analyses to identify features associated with trap success and nestbox use in a single species. Perennial vegetation was sampled at 338 live-trap stations and 91 nestbox sites in a 2 ha oak-hickory woodlot in NW Ohio. Backstep multiple regression analysis revealed that vine species, in particular Virginia creeper (Parthenocissus quinquefolia), were present at heavily used nestbox sites, but overall density of understory vegetation was not important. Discriminant function analysis showed that heavily used nestboxes were also characterized by high density of berry-producing species. The presence of vines for cover and berries for food may be the reason that mice prefer those sites. Heavily used sites were also associated with the presence of swamp white oak (Quercus alba) and ash (Fraxinus spp.). Previous workers have emphasized the role of structural features in habitat selection. Here we demonstrate that plant species are also important.

- 10:00 VEGETATION STRUCTURE, PLANT SPECIES COMPOSITION, AND HABITAT SELECTION BY BIRDS. John T. Rotenberry, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

Traditional studies of habitat occupancy patterns in birds have generally focused on the relationship between avian community structure (e.g., bird species diversity) and the physical structure and configuration of vegetation ("physiognomy"). The particular plant species composition of the habitat ("floristics") is either ignored or relegated to a minor role in determining these patterns. Consideration of avian communities as collections of individual bird species, however, suggests the opposite: in North American grassland habitats over half the variation in bird community composition was associated with floristic variation but only a third was associated with physiognomy. The results of these and similar studies in different habitats suggest that while gross habitat selection may be associated with physical structure, finer tuning of bird species abundance patterns may be with reference to particular plant species abundances.

- 10:15 TREE-NESTING AND NEST-SITE CHOICE IN ROCK DOVES (COLUMBA LIVIA). A. Townsend Peterson, 115 N. University Ave., Oxford, OH 45056.

In the spring of 1982, I censused Rock Dove nests in Oxford, Ohio. Fifty-four nests were found: 41 (75.9%) on buildings, and 13 (24.1%) in trees. Strong preference was shown for building nest-sites over all other available habitat types. Nest-tree heights were significantly higher than heights of buildings holding nests, however, there was no significant difference between the nest heights. Height and type of cavity were more important in site selection than nest-tree height and diameter. Silver Maples (Acer saccharinum) were selected more frequently for nest trees than other tree species. This study documents the second North American occurrence of Rock Doves nesting in trees. The high usage of trees for nest sites probably results from a recent reduction of urban nest sites.

- 10:30 PREY ACTIVITY SELECTION PREFERENCES IN CAPTIVE SCREECH OWLS (OTUS ASIO). Daniel C. Carey, Dept. Zoology, Miami University, Oxford, Ohio, 45056.

In a study to determine the importance of prey activity in prey selection, captive Screech owls (Otus asio) were offered free-roaming and restrained albino mice of similar size. Free-roaming mice were significantly more active than restrained mice and were selected significantly more frequently as a food item. Conspicuousness was equal for both prey items, and is discounted as a cause of the owl's preferences. It is thought that the owls are displaying an energy maximization strategy, and the greater activity may be perceived by the owls as an indicator of superior food value.

- 10:45 VARIATION OF COUNTS OF BIRDS IN A NORTHEASTERN OHIO WOODS. Cynthia Hafner and David Waller. Kent State University, Department of Biological Sciences, Kent, Ohio 44242.

Season- or habitat-related variability in bird populations can affect patterns revealed by restricted surveys of an area. If single surveys are to be effective indicators of birds present, then little variation should be present among spatial or temporal survey points. Bird populations of two adjacent sections of deciduous forest in Ashtabula County, Ohio were repeatedly observed over a two-month period. Three transect lines were established 580 feet apart, and stations were selected along these lines every 400 feet. At each stop, all individual birds observed by sight or sound for an eight minute interval were identified to species, counted, and recorded. Data for selected species were tested for randomness of occurrence among stations and among dates. Common species of birds that inhabit the floor of the woods (such as Ovenbirds and Wood Thrushes) did not occur randomly in the censuses, while common arboreal species (such as Eastern Wood Pewees and Red-eyed Vireos) were more random in their dispersion and seasonal occurrence. Uncommon species of both arboreal birds (such as Yellow-throated Vireos) and floor birds (such as Veerys) tended to vary more among dates than among stations. With these censusing methods, counts for species selected for analysis did not show lower variability among stations or among dates than would be expected for either random or aggregated occurrence of individuals.

## R. ECOLOGY

SECOND MORNING SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 334

R. PETER RICHARDS, PRESIDING

- 8:30 THE EFFECTS OF ATRAZINE AND METOLACHLOR ON THE VEGETATIVE GROWTH OF LEMNA MINOR L. Nancy Palmstrom and Kenneth A. Krieger. Heidelberg College. Tiffin, Ohio 44883.

The effects on the vegetative growth of Lemna minor L. by atrazine and metolachlor, both separately and in combination, were studied. Dose-response studies were used to determine the inhibitory effects of these pesticides on L. minor. The growth was measured as the addition of leaves (thalli) and buds to the plants. The plants were maintained at 25 °C under continuous illumination throughout the investigation using a growth chamber to control environmental conditions.

Plants treated with 10, 100, and 200 ug/l atrazine for a 92 hour period experienced 11.3, 34.1, and 66.9 percent inhibition, respectively, as compared with controls. Similarly metolachlor caused 12.2, 54.2, and 61.0 percent inhibition after 146 hours at concentrations of 10, 100, and 200 ug/l as compared with controls. When the pesticides were used in combination, at equal concentrations totalling 10, 100, and 200 ug/l of herbicide, similar percent inhibition levels resulted. There appeared to be no enhancement effects when the pesticides were used in combination. The results indicate that atrazine and metolachlor, used individually or in combination, significantly inhibited the vegetative growth of L. minor.

- 8:45 PESTICIDE CONCENTRATIONS IN SANDUSKY BAY AND THE LOWER SANDUSKY RIVER FOLLOWING A SPRING STORM. R. Peter Richards, Water Quality Laboratory, Heidelberg College, Tiffin, Ohio 44883.

In the rivers of northwestern Ohio, many non-point derived pollutants reach maximum concentrations in runoff following storms in spring and early summer. This pattern also characterizes many agricultural herbicides and insecticides. Concentrations of three pesticides (Atrazine, Alachlor, Metolachlor) measured during May and June 1982 exceeded 40 ug/l in the upper Sandusky River basin (Melmore, Ohio), and exceeded 15 ug/l in the lower reaches of the river (Freemont, Ohio) and in the upper portion of Sandusky Bay. By comparison, 5 ug/l is often taken as a concentration sufficient to inhibit photosynthesis in algae. In the bay, pesticides concentrations are well correlated with nitrate + nitrite, indicating that the pesticides are dissolved in the water, rather than adsorbed to suspended sediments.

- 9:00 THE TRANSFER OF PHOSPHATE FROM HUMIC SUBSTANCES TO BIOTA IN AN ACID BOG LAKE. James B. Cotner, Jr. and Robert T. Heath, Department of Biological Sciences, Kent State University, Kent, OH 44242.

Aquatic humic substances can release orthophosphate on irradiation with ultraviolet (UV) light. Since UV light is rapidly attenuated in brown water lakes, the

significance of phosphate release to the biota of a bog lake is not known. The effect of UV-sensitive phosphate release was investigated in Triangle Bog Lake (Portage Co., Ohio). Lake water was collected from the epilimnion and irradiated with sunlight. Aliquots were examined for release of soluble reactive phosphorus by humic materials and also by phosphomonoesters. Biotic uptake and release of orthophosphate was followed radiometrically using  $^{32}\text{P}$ -labeled orthophosphate.

Results to date suggest the release of phosphate from humic materials accounts for the greatest proportion of  $\text{PO}_4$  taken up by the biota. Other phosphorus sources are relatively insignificant. This represents an abiotic mechanism of control of the  $\text{PO}_4$  pool that may correlate to periods of maximum photosynthesis, i.e., during bright, sunny days.

9:15 THE EFFECTS OF AQUATIC PLANT HARVESTING ON THE NUTRIENT DYNAMICS OF A SMALL EMBAYMENT OF WENDELL R. LA DUE RESERVOIR, OHIO. Paul W. Anderson, G. Dennis Cooke, and Robert E. Carlson. Department of Biological Sciences, Kent State University, Kent, OH 44242.

A small bay in Wendell R. LaDue Reservoir (Portage Co., Ohio) was studied in summer, 1982, to determine if the dense community of macrophytes, dominated by Myriophyllum spicatum L., was a source of phosphorus, seston, and algae to the reservoir's pelagic waters. An aquatic plant harvester removed approximately 90% of the plant biomass in mid-summer. A section of the bay downstream was used as the control.

Water flowing out of the harvest bay had increased total P and seston concentrations after harvesting. Total chlorophyll and algal volume increased in the harvest bay outflow as compared to incoming water and the control. Macrophyte biomass recovered from harvesting, with no significant difference in biomass between control and harvest bays 22 days after treatment. After this, chlorophyll in the harvest and control bays were equivalent, but seston in the harvest bay outflow was higher than the control.

Neither the harvest nor the control bays contributed phosphorus to the water flowing through them. Our findings are inconsistent with current thought regarding nutrient release from macrophyte beds, and indicate that in some circumstances their contribution to the nutrient loading of the pelagic zone is insignificant.

9:30 EFFECTS OF ARTIFICIALLY INDUCED CIRCULATION. Thomas Brosnan and G. Dennis Cooke, Department of Biological Sciences, Kent State University, Kent, OH 44242.

Artificially induced circulation of lakes and impoundments is a management technique to control problems associated with eutrophication such as hypolimnetic anoxia, blue-green algal blooms and poor transparency. An air-lift system as described in Fast, (1975) was installed in Silver Lake (Summit Co., Ohio) and began operation in June, 1982. Temperature, dissolved oxygen and transparency were monitored. Two stations, representing the two deepest parts of the lake, were additionally examined for their vertical distribution of total phosphorus, soluble reactive phosphorus, chlorophyll, phytoplankton, zooplankton, and the presence of benthic macroinvertebrates.

One of the deepest stations remained stratified with regards to temperature, dissolved oxygen and the other variables while another deep area exhibited a more uniform distribution of these. Complete thermal destratification was occasionally observed at this and other stations. Dissolved oxygen was rarely uniform with depth. Transparency was reduced, zooplankton and benthic macroinvertebrates appear to have extended their ranges. The overall trophic state of the lake as determined by transparency, surface total phosphorus, and chlorophyll a concentration (Carlson, 1977) declined. These results indicate that the compressor was underpowered or that circulation induced turbidity or mixing of nutrients from the sediments into the water column.

9:45 INTERACTIONS BETWEEN BENTHIC STREAM ALGAE AND LOCAL CURRENT VELOCITIES. Michael A. Reiter and Robert E. Carlson. Dept. of Biological Sciences, Kent State University, Kent, Ohio 44242.

The water velocities of a stream can be divided into ambient velocities and those in or near algal mats (local velocities). The response of a benthic algal community to local vs. ambient water velocities was studied using a series of experiments in three 1.2 m glass flumes. Water velocities were measured in 1.5 mm intervals vertically from the substrate using Pitot tube methods. Equal area mat samples were taken weekly for genera and morphological form counts. After three weeks, the local water velocities were 50% or less of their initial values, while ambient values remained relatively unchanged. All three local velocity regimes became equivalent, and subsequent local velocity reductions occurred at equal rates despite differing ambient velocities. Mat samples at all three ambient velocities were equal in dry weight biomass and tended toward similarity in genera and morphological form. It is suggested that local water velocities diverge significantly from ambient velocities with mat growth, and become similar despite different ambient velocities. The supposed effects on algal mats associated with variations in stream water velocity may not exist because of the biological alteration of local stream velocity.



- 10:00 EFFECTS OF DIFFERENT INITIAL COLONIZERS ON THE OUTCOME OF SUCCESSION IN THE PERI-PHYTON OF A SMALL STREAM. R. B. Genter, J. T. Rotenberry, and R. L. Lowe. Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403, USA.

Clement's theory of succession would predict that two different communities placed into similar climatic and physical habitats eventually reach the same climax community. Conversely, Egler's theory proposes that the initial floristic composition is a major factor determining the outcome of succession. To test these hypotheses, two dissimilar nearby habitats were selected in a small stream. Two different habitats will be composed of two different algal communities. Six substrate holders, each capable of holding nine frosted acrylic substrates, were placed in both habitats. After an initial two-week period of colonization, three substrate holders were randomly traded between the habitats. Each habitat then had two different communities of algae. Substrates were then collected in a geometrically increasing sequence of days (1, 2, 4...) up to 64 days. Succession was observed using this technique. The data are evaluated with respect to these two separate theories.

- 10:15 SPATIAL AND TEMPORAL RELATIONSHIPS IN THE EPIPSAMMIC DIATOM COMMUNITY, MAPLE RIVER, PELLSTON, MICHIGAN. Ann R. Miller, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403 USA.

The epipsammic diatom community of a northern Michigan stream was examined during the summer of 1982. Spatial and temporal relationships were analyzed both quantitatively and qualitatively. A plexiglass collecting chamber with cleaned sand was placed in the stream and exposed to colonists. Collections of sand from the chamber were made every 4 days for a period of 5 weeks. Changes in species composition and diversity are reported. Community structure and spatial relationships on individual sand grains are examined using scanning electron microscopy. The epipsammic microflora was found to be very complex.

- 10:30 SOME EFFECTS OF FLY ASH EXTRACT ON A PERIPHYTON COMMUNITY IN FIELD ENCLOSURES. Kevin A. Karl, Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio, 43403.

In order to determine periphyton community changes due to fly ash extract, a field bioassay was conducted in the littoral zone of Douglas Lake, Michigan. Racks holding glass slides were cemented inside 4 aquaria and these were submerged in 0.8 m of water. After 17 days of colonization the aquaria were raised to the surface and half of the water was removed from each. Initial samples were taken (slides were removed) and stock extract was added to the three treatment aquaria to give 1.0, 2.4 and 5.6  $\text{gl}^{-1}$  concentrations. Subsequent samples were taken after 0.5, 1, 2 and 4 weeks. Samples were analyzed for chlorophyll-*a* and ash free dry weight. Algal community composition was determined from semi-permanent mounts of periphyton preserved *in situ* on the substrate slides. The addition of the extract greatly increased the sulfate concentration and lowered the pH of the aquarium water. The 5.6  $\text{gl}^{-1}$  concentration suppressed biomass accumulation and reduced live cell density, while the 1.0  $\text{gl}^{-1}$  concentration had little effect on these parameters. Other analyses include phytopigment ratios, autotrophic indices, diversity indices and relative abundance shifts. Lentic field bioassays on periphyton should be useful in ecotoxicology studies and environmental impact prediction.

- 10:45 SOME EFFECTS OF CRYSTOTILE ASBESTOS ON THE ULTRASTRUCTURE AND POPULATION DYNAMICS OF *CRYPTOMONAS EROSA* (A PLANKTONIC ALGAE). John Lauth and Karl Schurr. Department of Biological Sciences, Bowling Green State University, Bowling Green, Ohio 43403.

The presence of asbestiform fibers in the environment is a problem of increasing concern. A variety of health problems in man and laboratory mammals have been linked to asbestos contamination. Few studies on the environmental impact of asbestos contamination have been conducted. We investigated the effects of crysotile asbestos on a planktonic alga (*Cryptomonas erosa*). Crysotile represents 95% of the asbestos mined for industrial use. *Cryptomonas erosa* is a representative planktonic alga commonly found in the Great Lakes area. Scanning electron micrographs show that asbestos fibers attach to the walls of algal cells. *Cryptomonas* and asbestos aggregate into clumps and settle. Statistical analysis of *Cryptomonas* density in asbestos treated and control samples show an exaggerated variance due to treatment with crysotile asbestos ( $N=24$ ,  $F'=2.42$ ,  $P>F'=0.0349$ ). We are presently using transmission electron microscopy to investigate the possibility of morphological damage in *Cryptomonas* cells due to crysotile asbestos contamination.

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R. ECOLOGY

AFTERNOON SESSION, SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 334

WILLIAM D. HUMMON, PRESIDING

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1:30 BUSINESS MEETING

- 1:45 A PRELIMINARY SURVEY OF BLOWOUT PLANT COMMUNITIES ON THE INLAND DUNES OF THE OAK OPENINGS. H. Gordon Bailey, III. Department of Biological Sciences, Bowling Green State University, Bowling Green, OH 43403.

Recent disturbances of 12,200 year old barrier dune ridges from a fossil island of lower Lake Warren have provided unusual assemblages of plants that contrast with the surrounding Oak-Maple Forests of the Oak Openings. These disturbances were caused by farming and quarrying within historical times that have been modified by wind erosion into open sand depressions or blowouts. Preliminary presence/absence plant surveys of 76 blowout sites have shown some dominant species from the encroaching planted pine and Oak-Maple Forests as well as escapees such as Catalpa and Black Locust from abandoned farm sites. There are, however, 135 other species of trees, shrubs, forbs and grasses that are arranged in horizontal bands within each blowout. These bands range from xeric to hydrophilic plant assemblages as one moves down to the base of the blowout. The assemblages were analyzed by cluster analysis as well as by competition matrixes. The number of bands and therefore the diversity of each blowout is probably determined by the depth of the blowout and its relation to the underlying water table.

- 2:00 A SURVEY OF PHYTOPLANKTON IN OLD WOMAN CREEK ESTUARY.  
David M. Klarer, Old Woman Creek National Estuarine Sanctuary,  
2514 Cleveland Road East, Huron, Ohio 44839

The phytoplankton was sampled fortnightly at three sites within Old Woman Creek Estuary during 1981. These populations were dominated by diatoms and flagellates (Cryptophyceae and Euglenophyceae) during most of the year. The sharp declines in population numbers corresponded to high creek flow; suggesting that, at these times, the creek flushed the estuarine populations into Lake Erie. Several unusual algae, Gymnodinium acidotum Nyg., Neodesmus sp., and Scenedesmus planctonicus (Korš.) Fott, were recorded and their ecology will be briefly discussed.

- 2:15 PHYTOPLANKTON DISTRIBUTION IN CENTRAL LAKE ERIE. Barbara L. Stiver. Department of Botany, Ohio State University, 1735 Neil Ave., Columbus, Ohio 43210

A study was undertaken in the summer of 1979 to examine the distribution of phytoplankton at a station in the central basin of Lake Erie. Two surveys of plankton were studied, one in mid-July and one in mid-August. During both surveys the central basin was thermally stratified. Samples collected from six depths were analyzed chemically and microscopically. The major phyla found included Cyanophyta, Chlorophyta, Chrysophyta, Pyrrophyta, and Cryptophyta. A large population of the cyanophyte Oscillatoria was found in the metalimnion in July but very low populations of the algae were found in August. Metalimnetic populations of Ceratium were large. Some genera of algae were concentrated in the metalimnion where other genera were distributed throughout the water column. The distributions of the most common genera will be described as well as the contribution of each phyla to the total phytoplankton biomass.

- 2:30 EVIDENCES OF THE SOLAR CYCLE IN AN ENGLISH LAKE COMMUNITY, 1934-1980 John F. Wing, Eric Johnston, and Steve McFarland, Departments of Biology and Psychology, Wittenberg University, Springfield, Ohio 45501.

Wing (1982) showed how the 11-year solar cycle reverberates at ecologically-sensible lags through the food web of Wytham, an English woodland. This study extends his analysis to the freshwater food web of Lake Windermere, England. Lund's (1950)

data on Asterionella formosa Hass., Macan's (1976) data on waterbugs (corixidae), and Craig and Kipling's (1982) data on perch (Perca fluviatilis L.) and pike (Esox lucius L.) are correlated with proximal climatic variables: Manley's (1974) air temperature, Kipling and Roscoe's (1977) water temperature for Lake Windermere, and Gloyne's (1973) length of growing season; and with the distal variable of annual relative sunspot numbers ( $R_s$ ). Correlations were obtained between residuals around long-term, linear trends. At meteorologically sensible lags the climatic variables intercorrelated .47 - .78 ( $p < .005$ ) and at ecologically sensible lags the faunal series intercorrelated .51 - .62 ( $.10 > p > .001$ ). As expected, at appropriate lags, the faunal series correlated better with the proximal, climatic variables (.37 - .82,  $.05 > p > .001$ ) than with the distal, solar variable,  $R_s$  (.36 - .40,  $.05 > p > .01$ ) presumably because the climatic variable is the intervening, moderator variable. Ecological lag analysis shows solar-driven air temperatures mix into the lake, affecting the base of the food pyramid and thence reverberating upward at successively longer lags. Length of growing season affects the onset, duration and offset of these processes.

3:00 A COMPARISON OF MACROSCOPIC INVERTEBRATES LIVING IN BANGIA ATROPURPUREA AND CLADOPHORA GLOMERATA BEDS IN LAKE ERIE

Earl W. Chilton  
Zoology Department  
Ohio State University  
Columbus, Ohio 43210

Since it's appearance in Lake Erie, Bangia atropurpurea has spread rapidly, displacing the native Cladophora glomerata in the upper littoral zone of the lake. Data indicate that the only organisms capable of thriving among Bangia filaments are larval Chironomidae, while Cladophora supports a larger and more diverse community. It is hypothesized that the mucilaginous cell wall of Bangia provides a much less stable substrate for attached and clinging invertebrates than does the cellulose cell wall of Cladophora.

3:15 ECOLOGY AND DISTRIBUTION OF CHIRONOMIDAE (DIPTERA) IN CARROLL COUNTY OHIO. Dave McShaffrey, Department of Biology, The University of Akron, Akron, OH 44325.

Qualitative samples of chironomid larvae were taken from October 1981 to October 1982. Preliminary analysis of approximately 700 larval slides yielded over 45 taxa. The final list of taxa will constitute the first faunal record of the Chironomidae from Carroll County.

Samples were taken from Sandy Creek at Malvern, the Upper North Fork of Yellow Creek near Bergholz, Still Fork Swamp Nature Preserve, Still Fork of Sandy Creek, Pipe Run, Dining Fork of Connotton Creek, and Elk Fork of Yellow Creek. In addition, samples were taken from three lentic sites: Lake Mohawk, Leesville lake, and an oxygenated farm pond.

Most of the larvae collected were mounted on glass slides for identification. Whole body mounts were found to be easier and quicker to make than separate head capsule/body mounts, and were easier to identify. CMCP9AF was found to be a better mounting medium than ACS. Scanning electron microscopy of additional specimens aided viewing of external head capsule structures such as antennae.

Some larvae were placed in rearing vials to obtain pupae and adults to enhance identification. Yield of emerged adults was below percentages reported in the literature.

3:30 THE LAKE HOPE MINE DRAINAGE ABATEMENT PROJECT: RESULTS OF SEDIMENT FLUSHING EXPERIMENTS IN THE LABORATORY. William D. Hummon, Department of Zoology, Ohio University, Athens, Ohio 45701.

Experiments were performed using stream bottom sediments from Big Four Creek, lower (BFL, polluted) and Strouds Run, west (STW, unpolluted control). Four 1-liter graduated cylinders were filled with 700 ml of sediment, two replicates from each of the two sediment types, and were topped with 300 ml of STW water (pH 7.9; total conductivity 416  $\mu\text{mho/cm}$ , 25 C; alkaline cond. 180  $\mu\text{mho}$ ). The cylinders were shaken thoroughly, from end to end, at the beginning and end of each time interval; one set of experiments used 21 10-min intervals while the other used doubling time intervals increasing to 6 mo (16 intervals). Supernatant (SN) was replaced at the end of each interval with fresh STW water, and that exposed to sediments was analyzed for pH, total and alk. conductivity. Results from BFL seds indicate slow increase in pH of SN from 3.4 to 5.0 (in 21 10-min intervals) and from 3.3 to 4.3 (in 16 dblg intervals); SN from STW seds increased from 7.5 to 8.0 over the longer time span. Total cond. from SN of BFL seds decreased asymptotically from 1560 to 340  $\mu\text{mho}$  (in 21 10-min intervals) and elliptically from 1590 through 500 to 620  $\mu\text{mho}$  (in 16 dblg intervals); SN from STW increased exponentially from 430 to 570  $\mu\text{mho}$  over the longer time span. Alk. cond. from SN of BFL seds increased gradually from 0 to 7  $\mu\text{mho}$  (in 12th-21st 10-min intervals) and was not observed (even in 16th dblg interval); SN from STW increased exponentially from 180 to 280  $\mu\text{mho}$  over the longer time span. Thus, BFL seds appear to be removing alk. cond. and releasing total cond. over time. Grant support from Office of Surface Mining through Mining and Mineral Resources Res. Inst., OSU.

- 3:45 THE LAKE HOPE MINE DRAINAGE ABATEMENT PROJECT: RESULTS OF RECIPROCAL COLONIZATION EXPERIMENTS IN THE FIELD. William D. Hummon and Sirinimit Boonyuen, Department of Zoology and Environmental Studies Program, Ohio University, Athens, Ohio 45701.

Experiments were performed using graded stream bottom sands ( $0.25 \leq 0.50$  mm) from Big Four Creek, lower (BFL, polluted) and Strouds Run, west (STW, unpolluted, control).

Eight plastic boxes, 11 cm wide x 10 high x  $3\frac{1}{2}$  deep, were modified by cutting 6 openings,  $2\frac{1}{2}$  cm wide x  $3\frac{1}{2}$  high, both front and back. Boxes were lined with unbleached muslin, filled with experimental sediments and buried facing upstream - downstream. The system allowed interstitial water to flow through the boxes and micrometazoans ( $\leq 2$  mm length) to penetrate through the muslin to the sed within, while preventing interchange of sed from within and without the boxes. Reciprocal transfers of sed were set out 3 Oct 81, half the boxes being retrieved after 1 week and the other half after 4 weeks. Three cores, 1.85 cm diam x 8 deep, were taken from each box, were sectioned and the 0-1, 1-2, 3-4, and 6-7 cm fractions analysed independently, yielding  $3 \times 4 = 12$  samples/box x 8 boxes = 96 plus 48 control samples for a total of 144. Meiofauna were narcotized with 1%  $MgCl_2$ , extracted by multiple decantation, and counted and identified to order-level taxa using multiple Sedgwick-Rafter cell counts. Results of 3-way ANOVA by test site, duration, and test sediment show little interaction for No. Taxa, with  $STW > BFL$ ,  $28d > 7d$ , and  $Controls > STW$  sed  $> BFL$  sed. Log Total Abundance parallels No. Taxa but  $C > STW$  sed  $\geq BFL$  sed, while log Dipteran Abundance reverses these trends, resulting in heavy 3-way interaction for log Non-dipteran Abundance. Thus, BFL sed appear to inhibit colonization by all but Dipterans. Grant support from Office of Surface Mining through Mining and Mineral Resources Res. Inst., OSU.

- 4:00 THE LAKE HOPE MINE DRAINAGE ABATEMENT PROJECT: ACCLIMATIZATION OF CRAYFISH TO ACID MINE POLLUTED WATERS. Michael S. Gallaway and William D. Hummon. Department of Zoology, Ohio University, Athens, Ohio 45701.

Static Bioassay experiments were performed on two groups of crayfish from Big Four Creek. The upstream (US) crayfish were from clean water with total conductivity of 260  $\mu$ mhos/cm (25 C), the downstream (DS) crayfish from mine-polluted water with conductivity of 600  $\mu$ mhos. Crayfish were given two  $\frac{1}{2}$ -hour rinse baths in test solutions, and then placed in 100 ml jars with 50 ml test solution. Test solutions were made of combinations of milieu water from US and DS collection sites, and from effluent issuing directly from a capped mine (CM, conductivity 5000  $\mu$ mhos). This resulted in 7 test solutions with non-carbonate conductivities of 150 (US), 600 (DS), 1300, 2000, 3300, 3400, and 5000 (CM)  $\mu$ mhos respectively. Two Way ANOVA was performed on survivorship of crayfish in the 7 different test solutions ( $n=11$ ). Death was defined as cessation of movement upon stimulation. Data were  $\log_{10}$  transformed. Conductivity of water had a highly significant effect upon longevity ( $p < .001$ ), and the two populations of crayfish differed significantly in their ability to survive in polluted water ( $p < .05$ ). ANOVA interaction was not significant. A posteriori Student-Newman-Keuls tests were done to compare means; mortality rates for US crayfish increased sharply at 2000  $\mu$ mhos, and again at 3300  $\mu$ mhos. In the DS group, however, mortality increased only slightly (but significantly) at 150 and 2000  $\mu$ mhos, followed by a sharp increase in mortality at 3300  $\mu$ mhos. Crayfish from the downstream area showed broader and greater tolerance for waters of medium conductivity, but lower tolerance for clean water from upstream, indicating long term physiological acclimatization to acid mine pollution.

- 4:15 EFFECTS OF PRODUCTION AND PREDATION ON THE FRESHWATER PULMONATE SNAIL, LYMNAEA ELODES. Dennis R. DeVries<sup>1</sup>, Kenneth M. Brown<sup>2</sup>, and Roy A. Stein<sup>1</sup>. The Ohio State University<sup>1</sup>, Department of Zoology, 1735 Neil Avenue, Columbus, Ohio 43210; and Purdue University at Fort Wayne<sup>2</sup>, Department of Biology, Fort Wayne, Indiana 46805.

In comparisons of density and fecundity of Lymnaea elodes between a permanent and a temporary pond, we found that these snails were more abundant and had slightly higher fecundities in the temporary pond. Because the permanent pond had higher productivity (i.e., periphyton biomass), food apparently did not control snail abundance. By excluding snail predators we enhanced snail fecundities and individual snail growth over summer in the permanent pond but not in the temporary one. The central mudminnow (Umbra limi), a snail predator, present only in the permanent pond may be responsible for reducing survival of either eggs or juveniles in this environment.

- 4:30 BACKWATER AND MAINSTREAM ORIGIN OF LARVAL FISH IN THE OHIO RIVER, AND SIZE SELECTIVE PREDATION BY POWER PLANTS. Bernard J. Moller University of Cincinnati, Department of Biological Sciences, Cincinnati, Ohio 45221

Since the advent of the high dams on the Ohio River, the natural morphology of the mainstream and backwaters has been changed. The importance of backwaters as breeding habitats and nursery areas for fish has been evaluated using analysis of size class densities and examination of relative frequencies of all larval fish taken in biweekly tows, using a 505u mesh ichthyoplankton net, during the summer of 1981. The mainstream river station samples and the samples taken in the backwaters showed marked differences in the size class frequencies of several families suggesting a river origin for the Sciaenidae and the Catastomidae, and a backwater breeding preference for the Cyprinidae, Centrarchidae and

## INFORMATION AND LIBRARY SCIENCES

the Clupeidae. The J.M. Stuart Power Station(r.m. 405.6) cooling water effluent channel showed a larval fish size class frequency distribution tending toward fewer individuals, on most dates than that found in the mainstream. Preliminary investigation suggests a possible family specific behavior dependency in the disproportionate sampling of some mainstream fish by the power plant, on some dates. Overall the power plant is a size selective predator of larval and post larval fishes.

- 4:45 SEASONAL DIFFERENCES IN THE TOLERANCE OF ETHEOSTOMA BLENNOIDES, E. CAERULEUM, AND E. FLABELLARE (PISCES:PERCIDAE) TO DECREASING OXYGEN LEVELS.  
I. Hlohowskyj and T. E. Wissing, Department of Zoology, Miami University, Oxford, OH 45056.

Darters of the genus Etheostoma are abundant in many streams in eastern North America. Among the abiotic factors which may influence the distribution and habitat selection of these forms is dissolved oxygen concentration. This study was designed to assess seasonal differences in the tolerances of the greenside (E. blennioides), rainbow (E. caeruleum), and fan-tail (E. flabellare) darters to low oxygen concentration. Darters were collected from Indian Creek and Lost Creek, Ohio in summer and fall of 1982, and exposed to decreasing oxygen concentration until loss of equilibrium occurred. The tolerances of the three species to low oxygen concentrations increased from August to October. In summer, E. blennioides showed a minimum oxygen tolerance of  $3.56 \pm 0.18$  mg O<sub>2</sub>/l; the corresponding values for E. caeruleum and E. flabellare were  $2.15 \pm 0.08$  and  $2.49 \pm 0.07$  mg O<sub>2</sub>/l. In the fall, all of the species increased their tolerances to low oxygen levels. E. blennioides ( $2.57 \pm 0.08$  mg O<sub>2</sub>/l) was still the least tolerant of the three species, followed by E. caeruleum ( $2.25 \pm 0.13$  mg O<sub>2</sub>/l) and E. flabellare ( $2.15 \pm 0.14$  mg O<sub>2</sub>/l). The large differences in oxygen tolerances among the three species during the summer were not observed in the fall. Lower oxygen tolerances in summer may be due to higher metabolic costs when stream temperatures are maximal. If dissolved oxygen levels influence the distribution of these species, their effects are more likely to be important in the summer months.

- 5:00 SEASONAL TRENDS IN CARBON, NITROGEN AND ORGANIC CONTENTS OF THE POTENTIAL AND INGESTED FOODS OF GIZZARD SHAD (DOROSOMA CEPEDIANUM) IN ACTON LAKE, OHIO.  
Neal D. Mundahl and Thomas E. Wissing, Department of Zoology, Miami University, Oxford, OH 45056.

The gizzard shad (Dorosoma cepedianum) is detritivorous throughout much of its life cycle in Acton Lake, a 253-hectare impoundment in southwestern Ohio. This study was designed to assess seasonal changes (May-November, 1982) in the quality of potential shad foods and materials in the digestive tract. Detrital materials consumed by gizzard shad displayed seasonal trends in quality that were similar to those for surface sediments. Low organic contents (< 100 mg organic matter/g dry weight) and high C:N ratios (> 15:1) were observed in surface sediments and ingested materials in mid- to late summer. Seasonal trends were present in the quality of periphyton collected from seawalls and submerged trees, but these appeared to be unrelated to shad nutrition. Feces organic contents (164-473 mg organic matter/g dry weight) and C:N ratios (4.85-8.88:1) also varied seasonally, but were similar to values for materials from the anterior digestive tract. Gizzard shad condition factors (1.98-2.57) increased throughout much of the study period, as did the organic contents (919-929 mg organic matter/g dry weight) and C:N ratios (3.19-3.67:1) of muscle tissue. The fact that shad grow more slowly in this system than in other comparable reservoirs may reflect interactions among high population density, predation pressures, and the quality and quantity of the food supply.

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## S. INFORMATION AND LIBRARY SCIENCES

MORNING SESSION, FRIDAY, APRIL 22, 1983

LIBRARY, ROOM 126

G. ROBERT McLEAN, PRESIDING

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8:45 BUSINESS MEETING

9:00 INFORMATION SKILLS FOR INTERNATIONAL STUDENTS  
Peter Archer and Barbara Brock, University of Toledo, 2801 West Bancroft,  
Toledo, Ohio 43606

International students studying at American universities need to acquire not

only linguistic skills but information skills, the ability to access, evaluate, and synthesize information from the multitude of forms in which it is produced. Such skills are essential for trained professionals in today's world of expanding information.

This instruction is particularly needed in scientific fields, both because of the large number of international students studying these areas and because of the complex methods used for accessing and processing this information. Science's highly precise use of language poses an acute challenge to students and teachers of information skills.

At The University of Toledo Carlson Library, a multi-component program to address these issues has been in place since 1980. The program has developed several methods of teaching information skills to foreign students. Science teachers are urged to cooperate with librarians in organizing similar programs.

- 9:30 LIBRARIES & ARCHIVES: CRITICAL DISTINCTIONS, MUTUAL CONCERNS, AND THE NEED FOR INCREASED COOPERATION Joel Wurl, University Archivist  
William S. Carlson Library, University of Toledo, Toledo, OH 43606

Archival institutions have been proliferating rapidly over the past decade. Many colleges and universities, such as the University of Toledo, are establishing new archives operations, and in most instances these programs are located in or affiliated with the library. The alliance between these two types of information centers is not as natural or self-evident as it may seem at first; linking them administratively or physically is not always in the best interest of either function. The unavoidable present and future coexistence of archives and libraries, however, necessitates greater understanding and cooperation on the part of employees from both institutions.

This paper discusses how librarians and archivists who find themselves in the same work environment can benefit from the situation by becoming aware of each other's goals and methods. It also explores the broader issue of the urgency for increased cooperation on a profession-wide basis in confronting mutual concerns such as conservation and information automation.

- 9:45 ORAL HISTORY PROJECT AT THE UNIVERSITY OF TOLEDO LIBRARY. Ina J. Weis,  
William S. Carlson Library, University of Toledo, Toledo, Ohio 43606.

What is oral history, and why has it become important for libraries and librarians? This question will be answered: (1) in defining oral history; history of oral history; oral history movement; Oral History Colloquium; Oral History Association goals and guidelines; oral history project equipment; oral history interviewing and tips for interviewers; processing records; auditing; editing; indexing; transcribing; storage and use of equipment; forms; worksheets, and draft letters for an oral history program; and (2) by providing procedures in developing this program in an academic library with reference to topics of an Oral History Project at the University of Toledo Library.

- 10:00 MASS CIRCULATION SYSTEM FOR AUDIO CASSETTE MATERIALS. Patrick C. Boyden, 221 Library Building, Kent State Univ., Kent, Ohio 44242

In 1973, an exchange system was developed at Kent State Univ. for for the circulation of audio materials in cassette format. The system obviated the need for an expensive dial-access system or the paper work involved in a traditional charge-out system.

This EXCHANGE system, which requires the student to purchase only the first cassette and thereafter exchange for the next in the series, is supported by the multiple, high-speed duplication of these lesson tapes. The system has been in operation for nine years and has eliminated the need for charging-out materials, checking them back in, reshelving and late-notices or fines. Paper work is eliminated, while materials security and quality control are maximized by means of bulk erasing and re-recording all returned cassettes.

The major benefit is to the students, each of whom has his own personal copy of each current lesson and may trade it in for the next lessons whenever he wishes. The materials are always in circulation, yet always on reserve as well.

Tens of thousands of copies of lessons in math, chemistry, music and particularly foreign languages, are circulated by this system each year. A relatively small amount of duplicating equipment is required (a master unit and six slave units) to handle the needs of even a very large university.

## INFORMATION AND LIBRARY SCIENCES

- 10:30 DANIEL DRAKE AND THE ORIGIN AND INFLUENCE OF MEDICAL LITERATURE IN CINCINNATI -- EARLY TO LATE 1800'S  
Billie Broadus, Director, History of the Health Sciences Library and Museum, M.L. 574, University of Cincinnati, Cincinnati, Ohio 45267

Daniel Drake left a great legacy in the West and none so great as his contribution in championing the development of a body of medical literature in Cincinnati during the 1800's. The paper presents a brief overview of Drake's early life and demonstrates the personal attributes that contributed to the development and advancement of medical journal publication. A list of medical journals published in Cincinnati from 1820-1890 will be part of the presentation.

### 10:45 BREAK

#### 11:00 THE LIBRARY TOUR FLIGHT PLAN.

Kathleen Voigt  
Head, Reference Dept.  
Carlson Library  
University of Toledo  
2801 W. Bancroft St.  
Toledo, OH 43606

Each summer freshmen spend 1½ days on the University of Toledo campus participating in a program entitled "FARP" (Freshman Advising/Registration Program). This past summer the Reference Department of Carlson Library coordinated a new venture by incorporating a physical tour of the library into the program. The tour and the flight plan we used was adapted with modifications from one used at The Pennsylvania State University, Capitol Campus Library. A detailed explanation of the development of the round robin flight plan is explored showing how an academic library can introduce a large number of students to its facilities and services in less than an hour and with little confusion.

#### 11:15 INFORMATION RETRIEVAL SKILLS INTEGRATED INTO BASIC EDUCATION OF HEALTH CARE PROFESSIONALS. Stephen E. Harmony, Acting Director of Information Services. Medical Center Libraries, University of Cincinnati, M.L. 574, Cincinnati, OH 45267.

The Medical Center Libraries (MCL) of the University of Cincinnati have made important strides in incorporating bibliographic instruction on research methods and resources into the core curricula of the U.C. Colleges of Medicine, Nursing and Pharmacy. Five years ago only brief optional twenty minute tours of the Medical Center Libraries were offered to new students in the three Colleges. Presently, library orientations and tours are incorporated into the general orientation required of all beginning students. Comprehensive lectures on research methods and resources are offered as a part of required undergraduate and graduate courses in the Colleges of Nursing and Pharmacy. Two hour sessions on basic research skills and biomedical resources are offered at least once a month to third year medical students.

In conjunction with these bibliographic instruction activities, MCL staff members have developed a number of instructional materials such as a self-instructional workbook entitled The MCL Formulary and a videotape program on nursing materials and resources. MCL is currently investigating the development of computer assisted instruction programs.

Medical Center Libraries staff members are also actively involved in the planning and development of the curricula by significant participation in the curricula committees of the Colleges of Medicine, Nursing and Pharmacy.

#### 11:45 COMPUTER-BASED BIBLIOGRAPHIC INSTRUCTION. Ava Krinick Fried, Director, Nursing and Health Library, University of Cincinnati, ML 38, Cincinnati, Ohio 45219.

The University of Cincinnati Nursing and Health Library has established a comprehensive bibliographic instruction program to teach library and research skills to undergraduate and graduate nursing students. In an effort to meet the needs of a growing number of students with diverse abilities and speeds of learning, the library has developed a multi-faceted approach including a self-study workbook, an instructional videotape, and most recently, a computer-assisted-instruction (CAI) learning package.

CAI is being mainstreamed into many phases of the educational process. Because of its versatility, flexibility, and interactive potential, it is a powerful tool for individualizing library instruction. The Nursing and Health Library has developed CAI modules to teach 1) the organization of the library

and the application of basic library skills, 2) the development of search strategies based on specific information needs, and 3) the use of specialized indexes including Index Medicus, International Nursing Index, and Cumulative Index to Nursing and Allied Health Literature. During the coming year, the library will be evaluating the effectiveness of this alternative bibliographic instructional approach.

12:00 "WHEN HARRISON'S ISN'T ENOUGH: SEARCHING THE BIOMEDICAL LITERATURE"  
BIBLIOGRAPHIC INSTRUCTION FOR MEDICAL STUDENTS  
Jane Z. Gorsky Bibliographic Instruction / Reference Librarian  
Medical Center Libraries  
231 Bethesda Ave. (M.L. #574)  
Cincinnati, Ohio 45267

The Information Services department of the Medical Center Libraries of the University of Cincinnati has developed a seminar entitled "When Harrison's Isn't Enough: Searching the Biomedical Literature," prepared specifically for third and fourth year medical students. ("Harrison's" refers to Harrison's Principles of Internal Medicine.) Among the topics covered are: 1) the organization of medical literature, 2) how to identify and locate current journal articles and reviews by using Index Medicus, Medical Subject Headings, Science Citation Index, and Psychological Abstracts, 3) how and when to request a MEDLINE computerized literature search, 4) how to keep up with the latest publications by using Current Contents. In addition, all participants are entitled to one complimentary MEDLINE search, for attending.

This two hour seminar is offered monthly. A student need attend only once. Attendance is optional. The seminar is publicized by the distribution of notices, the placement of announcements in newsletters, and appearances by the instructor at orientations for medical students.

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## S. INFORMATION AND LIBRARY SERVICES

AFTERNOON SESSION FRIDAY, APRIL 22, 1983

SCIENCE LIBRARY, THIRD FLOOR, MATHEMATICAL SCIENCES BUILDING

JANET CHISMAN, PRESIDING

### WORKSHOP

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1:00 DUNGEONS AND DRAGONS: THROUGH THE MAZE OF SCIENTIFIC LITERATURE. Janet Chisman, Flo Hidalgo, Kathleen Voigt, Ron Waterson. Science Library, Bowling Green State University, Bowling Green, OH 43403.

This informal, invitational workshop is for high school students who want to locate scientific information on topics of interest to them. Scientists and information specialists will be available to guide students through the labyrinth of print and computerized resources, to reveal a method in the apparent madness, to unveil the skeleton of the scientific literature. Exchange of ideas, questions, methods will be emphasized. The workshop will be held on Friday, April 22, 1-3p.m. in the Science Library, Mathematical Sciences Building.



POSTER SESSIONS

SATURDAY, APRIL 23, 1983

LIFE SCIENCES BUILDING, ROOM 327

BOARD A IN VITRO EFFECTS OF TUMOR PROMOTERS ON RAT URINARY BLADDER EPITHELIAL CELLS. Bruce A. Barut and James E. Klaunig, Department of Pathology, Medical College of Ohio, Toledo, OH 43699.

9:00 am The present study investigated the effects of some purported bladder tumor promoters on rat urothelial cells in vitro. Two cell lines, RBL-01 (a normal rat urothelial cell line) and Ay 27 (a FANFT-induced rat transitional cell carcinoma line) were used. Initial experiments investigated the conditions for optimal cell growth of these lines. A clonal growth assay was employed to determine the influence of serum and calcium concentrations on cell growth. AY 27 grew optimally in 2.5 mg (serum protein)/ml (medium) using fetal bovine serum (FBS) (1.175 population doublings/day (PD/D)) and 1.0 mg/ml for dialyzed fetal bovine serum (DFBS) (1.076 PD/D). RBL-01 cells displayed optimal growth in 2.5 mg/ml of FBS (1.463 PD/D) and 1.0 mg/ml of DFBS (1.342 PD/D). For AY 27 cells, growth was observed in calcium concentrations from  $1 \times 10^{-6}$  M to  $1 \times 10^{-3}$  M. Optimal growth was observed at  $1 \times 10^{-3}$  M and  $5 \times 10^{-4}$  calcium. RBL-01 cells displayed optimal growth at  $5 \times 10^{-4}$  calcium, but no growth at calcium concentrations below  $1 \times 10^{-5}$  M. L-tryptophan, saccharin, urea, caffeine and 12-O-tetradecanoylphorbol-13-acetate (TPA) were investigated for clonal growth stimulatory effects on AY 27 and RBL-01 cells. Five concentrations of each compound were studied. Saccharin and urea produced no significant increases in clonal growth of AY 27 and RBL-01 cells over controls at any of the concentrations studied. L-tryptophan induced a significant increase in clonal growth of both cell lines at a concentration of 0.1 ng/ml (RBL-01; 20% increase; Ay 27; 15% increase) and in RBL-01 cells at a 1.0 ng/ml concentration (17% increase). Caffeine produced a significant increase in clonal growth of RBL-01 cells at concentrations of 0.1 ng/ml, 1.0 ng/ml, 10 ng/ml and 100 ng/ml and in AY 27 cells at a 0.1 ng/ml concentration. TPA produced a significant increase for AY 27 cells at a 0.1 ng concentration (11% increase) however it did not increase growth in RBL-01 cells. Changes in cell morphology were observed in saccharin and TPA treated cells.

BOARD B IN VITRO EFFECTS OF HEMATOPORPHYRIN DERIVATIVE (HPD) ON BLADDER UROTHELIAL CELLS. Janine R. Shulok, James E. Klaunig, Steven H. Selman, Rick W. Keck, Martha Kreimer-Birnbaum, and Peter J. Goldblatt, The Departments of Pathology and Urology, Medical College of Ohio, Toledo, Ohio.

9:00 am Hematoporphyrin derivative (HpD) has been shown to have both localizing and phototherapeutic effects on neoplastic cells in vivo. In the present investigation, the cellular effects of HpD on rat bladder urothelial cells was studied using RBL-01 (normal rat bladder) and AY 27 (transitional cell carcinoma) cells taken from F-344 rats. Initial experiments focused on the toxicity of HpD to both cell types under various conditions. Cells were exposed to varied concentrations at HpD (50 ug/ml to 1 ug/ml) for 1 hr. followed by either light treatment or incubation in the dark. Staining with trypan blue was used as the indicator of cell death. Both AY 27 and RBL-01 cells displayed a dose-response effect to HpD after treatment with light. HpD was more toxic to the AY 27 cells than to the RBL-01 cells. Exposure to 50 ug/ml resulted in 100% loss of viability to the AY 27 while killing only 30% of the RBL-01 cells. No cellular toxicity was observed in HpD treated cultures that remained in the dark. When AY 27 and RBL-01 cells exposed to HpD for 1 hr. were treated with light at varying time periods after exposure, the percent of dead cells decreased with increased duration of the time period following HpD exposure. Using a clonal growth assay, HpD (25 ug/ml) produced a significant inhibition of clonal cell division (over controls) in both AY 27 (67% inhibition) and RBL-01 (67.5% inhibition) cells after 96 hrs. exposure to HpD. HpD exposure for as little as 24 hrs. resulted in inhibition of cell division. Supported in part by grants from the F.M. Douglas Foundation and The American Cancer Society (Ohio Division).

BOARD C EFFECTS OF HYPERVITAMINOSIS D ON CALCIFICATION OF THE LONG BONES OF THE RAT. Kevin Sean Kimbro, 800 Olympian Circle, Dayton, Ohio 45427.

9:00 am The action of vitamin D sterols on the calcification process under the conditions of hypervitaminosis is not well understood. While it is clear that vitamin D will cure rickets in children and osteomalacia in adults when given in physiological doses, the specific consequences of pharmacological doses of vitamin D in healthy individuals remains to be established. The purpose of the present study was to determine the morphological effects of large doses of vitamin D on the calcification of the long bones of rats. Young adult male albino rats were given routine laboratory rat chow ad libitum along with oral doses (200 I.U.) of vitamin D<sub>2</sub> (ergocalciferol) each day for 21 days. Control rats were given the same chow ad libitum, but without the vitamin supplement. After sacrifice both femurs and humeri were removed from all animals and cleaned of adherent soft tissue. Each bone was measured, x-rayed, and prepared for either paraffin or frozen sectioning. Bone lengths did not significantly differ between the two groups. Histological examination revealed an increase in the zones of hypertrophy and calcification in the proximal epiphyseal plates. Radiographic examination indi-

cated increased mineralization along the shafts and heads; this observation was confirmed by densitometry measurements of the x-ray plates. The results of this study suggest that short term administration of large doses of vitamin D in the rat significantly increases the calcification of specific areas in long bones without affecting the overall growth in length of the bones. (Supported by Gem City Medical, Dental and Pharmaceutical Society)

BOARD D EFFECT OF ADRIAMYCIN ON THE MORPHOLOGY OF THE TESTES OF ADULT RATS. G.A. Bonanni,  
@ J.C. Lee and P.K. Bajpai, Department of Biology, University of Dayton, Dayton,  
9:00 am Ohio 45469

For a long time cell-DNA was considered the primary target for cytotoxic action of the chemotherapeutic drug Adriamycin (ADR). Recently it has been reported that ADR also exerts its cytotoxic effects by interacting with the surface of the cells. The following study was conducted to investigate the cytotoxic effects of ADR on rat testes. Equal numbers of rats (18) were injected 3 times weekly with saline or ADR (1.1 mg/Kg) for periods of 4, 8 and 12 weeks. Following each treatment period several rats were perfused intravascularly via the aorta with phosphate buffered saline (pH 7.4), 1.5% and 3% buffered formaldehyde-glutaraldehyde solutions respectively. Samples of tissues from testes of perfused rats were processed for light and electron microscopy. Sections for light microscopy were stained with Nucleal-PAS-Orange G and for electron microscopy with uranyl acetate and lead citrate. Microscopic examination of the testes obtained from ADR-treated rats revealed progressive destruction of seminiferous tubule organization, reduction of primary spermatogonia with subsequent deterioration of spermatogenesis and, decrease in tubule diameters and increase in tubule density. Ultrastructural examination indicated extensive damage to the basement membrane of the seminiferous tubules. Sertoli and germ cells of the testes obtained from ADR-treated rats exhibited nuclear as well as mitochondrial damage. Results of this investigation suggest that Adriamycin is cytotoxic both at the cellular and nuclear levels.

BOARD E A RAPID METHOD FOR DETERMINING NORMAL WEIGHTS OF MEDIUM-TO-LARGE MONGREL DOGS.  
@ P. Pendergrass, M. Bartley, F. Nagy, L. Ream and R. Stuhlman, Departments of Anatomy  
9:00 am and Laboratory Animal Resources, Wright State University, School of Medicine,  
Dayton, Ohio 45435.

Increased emphasis on nutritional status of dogs is evidenced by the recent development of product lines designed to provide maximum canine nutrition without associated obesity. However, specific weight standards, such as those available for humans, have not been determined for dogs. Consequently, ideal weights for adult dogs are based largely on subjective evaluation. The lack of objective standards is unfortunate because it hinders owners, practitioners, and researchers in making sound judgments about the nutritional status of a dog. In the study reported here, correlations were made between weight and the easily determined parameters of length, circumference and height in a population of adult mongrel dogs. Statistical analyses of data provided information used in the compilation of a table of normalized weights for dogs within the range included in the study. The length, circumference, and weight of 63 (29 female, 34 male) unconditioned mongrel dogs were measured. Combined totals were used to plot regression lines for length:weight, circumference:weight, and height:weight. Correlation coefficients for the lines were 0.85, 0.76, and 0.41 respectively, and standard errors for the lines were 2.25, 3.20, and 3.95 respectively. Circumference, the best parameter for predicting weight, was selected and used to compile a table of normalized weights expressed in kilograms and pounds for convenient comparison.

BOARD A A DIRECT METHOD FOR THE DESIGN OF DIGITAL PID CONTROLLERS FOR POWER GENERATOR  
@ EXCITATION AND GOVERNOR SYSTEMS. A. Ghandakly, Peter Kronegger, Dept. of  
10:00 am Electrical Engineering, The University of Toledo, Toledo, Ohio 43606.

This paper describes the design of digital PID controllers for the governor and exciter control systems of a synchronous generator. For this purpose the generator is initially represented in details by a seventh order differential model. A simplified transfer function is then derived from that model. The exciter and governor systems are represented by simple transfer functions in the S-domain. By transformation to the Z-domain and applying root-locus techniques the parameters of both controllers are found independently. Computer simulations results are presented to show the effectiveness of the controllers obtained. Work is currently being pursued for laboratory implementation of these controls using an on-line minicomputer.

## POSTER SESSIONS

BOARD B DOES PEROMYSCUS LEUCOPUS PREFER ANT-DISPERSED SEEDS? Susan Hansler and E. Raymond Heithaus. Biology Department, Kenyon College, Gambier, Ohio 43022.

10:00 am The seeds of ant-dispersed plants (myrmecochores) are subject to severe predation by Peromyscus leucopus in deciduous forests. The lipids that attract ants make myrmecochores easy to detect and potentially more nutritious than non-myrmecochores. The goal of this study was to determine whether Peromyscus leucopus prefers myrmecochores. Feeding preferences were studied during June, 1981 and 1982, in the Monongahela National Forest, West Virginia. Individual mice were offered choices of myrmecochore and non-myrmecochore seeds that were naturally available. Seed locations were randomized in an experimental enclosure.

There was no support for the hypothesis that mice prefer myrmecochores over non-myrmecochores. Consumption of seed types was highly variable and indicated a lack of selectivity. Asarum canadensis was the only myrmecochore that showed a tendency to be selected over non-myrmecochores. In addition, Peromyscus leucopus exhibited an aversion to the myrmecochore, Jeffersonia diphylla. Observed preferences were more consistent with the alternate hypothesis that selection of seeds is sensitive to seed size.

BOARD C MT. ST. HELENS: IN SITU BURIAL OF TREES AS AN ANALOGUE FOR THE INTERPRETATION OF FOSSIL FORESTS. Timothy H. Jefferson and Amy L. Karowe.  
10:00 am Institute of Polar Studies, and Department of Botany, Ohio State University, Columbus, Ohio 43210.

In August of 1982, some of the mudflows and fluvial sediments which buried trees following the 1980 eruption of Mt. St. Helens were investigated. Trees buried in older mudflows (36000 BP and 1885) were also examined and two mudflows were dated using dendro-chronology. Although many logs were clearly transported, large numbers of trees were buried in growth position. Some trees survived burial in up to 1 m of fluvial sediment and deposition of a layer of ash on trunks to a height of 6 m. Scanning electron microscope examination of samples from a range of ages and environments show that all are well preserved, indicating that woody tissue can survive in mudflows for long periods of time. Some woods show incipient mineralization: volcanoclastic sediment clearly provides an excellent environment for early silicification of plant material. Most petrified forests are found in association with volcanoclastic sediment. Features very similar to those seen in southern Washington are also found in fossil forests associated with mudflows (e.g., in Yellowstone National Park and in "Ginkgo" Petrified Forest, Washington) and in fossil forests preserved in volcanoclastic fluvial sediment (in Alexander Island and the Transantarctic Mountains, Antarctica; in Patagonia; and in Petrified Forest, Arizona). Observations in the Mt. St. Helens area provide valuable insight for the interpretation of fossil forests of various ages around the world.

BOARD D HOST RESPONSE TO LECITHODENDRIIDAE (TREMATODA) SPOROCYSTS IN GONIOBASIS SNAILS.  
10:00 am Jeffrey D. Stamper and John L. Crites. Ohio State University.  
Columbus, Ohio 43210.

Lecithodendriidae sporocyst aggregates were collected from the digestive glands of Goniobasis livescens found in the Olentangy river in Columbus, Ohio. Thin sections were prepared and examined with the aid of a transmission electron microscope. Host response to sporocyst infection show fibroblast infiltration associated with the sporocyst aggregate, and infiltrating between individual sporocysts. Collagen fibers are present in cross section and longitudinal section.

BOARD E IMPROVING SCIENCE CURRICULUM WITH RELEVANT NATURE CENTER PROGRAMS  
10:00 am Martha Monroe and Jan Wolanin, Dahlem Environmental Education Center  
7117 S. Jackson Road, Jackson, Michigan 49201

Across the country, school groups visit nature centers to learn more about the natural world. Unless their experiences are specifically linked to the urban environment and to their school curriculum, however, these ecological concepts will be largely irrelevant and out-of-step with their academic education.

The Dahlem Environmental Education Center has developed a series of 14 grade-specific elementary school programs that make intentional links between the natural and the built

environments. These programs have been readily accepted by schools and teachers because they: 1) are built upon national science objectives, 2) include teacher packets with pre- and post-trip activity ideas, information, and resources, 3) provide varied and sequential experiences, and 4) address the cognitive, affective, and skill domains. The packets will be useful to other centers because the topics are typical of their existing programs.

The programs and materials were designed with the aid of professional environmental educators and committees of local teachers, and implemented by trained volunteers. After a season of field testing, program evaluation will begin in the spring, 1983.

BOARD A  
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2:00 pm DESIGN OF AN EXCITATION CONTROL SYSTEM TO A WIND GENERATOR FOR MAXIMUM OUTPUT POWER. A. Ghandakly, R. King, M. Vichitchot - Dept. of Electrical Engineering, The University of Toledo, Toledo, Ohio 43606.

The operation of a small wind generator connected to the electric power system through a d-c link is presented in this paper. The system consists of a wind turbine driving a synchronous generator through a gear box. The output of the generator is supplied to the power system through an SCR bridge rectifier-inverter link. The generator excitation is electronically controlled so that the generator output is maximized at the driving wind speed. Computer simulation results are presented to assess the excitation controller design and the overall system performance. Both steady-state and dynamic characteristics are considered.

BOARD B  
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2:00 pm DO ZOOPLANKTON PLAY AN ACTIVE ROLE IN INTERNAL PHOSPHORUS CYCLING? M.J. Boavida and R.T. Heath. Department of Biological Sciences, Kent State University, Kent, Ohio 44242.

Although the participation of zooplankton in phosphorus dynamics is generally recognized, they are usually attributed a passive, indirect role in the cycling of this nutrient. Our results indicate that zooplankton may affect the regeneration processes of orthophosphate in a direct manner by producing alkaline phosphatase in response to the nutrient conditions of the environment and releasing the enzyme into the water. We have shown in laboratory experiments, using two species of plankton, that Daphnia magna produce their own phosphatase, which is distinct from the phosphatase activity of their prey, Chlamydomonas acidophila; furthermore, when they were fed food other than Chlamydomonas, the Daphnia did not produce phosphatase. Such results allow us to speculate that zooplankton may behave in a similar way in nature, adaptively producing phosphatase according to the quality of their food.

BOARD C  
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2:00 pm SURFACE MORPHOLOGY AND ULTRASTRUCTURE OF THE FIRST-STAGE LARVAE OF A PHILOMETRA SP. (NEMATODA:PHILOMETRIDAE) FROM FRESHWATER DRUM, APLODINOTUS GRUNNIENS. Rosmarie Kelly, John L. Crites and Carl T. Singley. Department of Zoology, The Ohio State University, Columbus, Ohio 43210.

First-stage larvae of Philometridae exhibit the ability to attach to particles in water, attracting copepods, the intermediate host. Further, once ingested, larvae burrow through gut wall of copepod into haemocoel where they develop. The anterior and posterior ends of Philometra larvae were viewed using electron microscopy in order to detect presence of an egg tooth for penetration and structures for attachment on tail. Presence of an egg tooth has been previously described using light microscopy, but no tail structures have been described for larval philometrids. The posterior end of the tail of first-stage larvae of Philometra sp. show a concave oval-spatulate area that from the side resembles a hook. Preceding this structure, tail narrows to a small cuff. No external openings were observed. The cephalic end has a single papilla-like structure previously described as an egg tooth. Also present, dorsal and ventral to the oral opening, are cuticular bars which are not seen on adult Philometra sp. A pair of pores are seen, one to each side of the oral opening. These are most likely amphids.

BOARD D  
@  
2:00 pm HISTOPATHOLOGY OF FISH LIVERS EXPOSED TO CARCINOGENS. William K. Parland, The Ohio State University, Department of Zoology, 1735 Neil Avenue, Columbus, Ohio 43210. Paul C. Baumann, CNFRL Field Research Station, The Ohio State University, Museum of Zoology, 1813 N. High Street, Columbus, Ohio 43210.

Guppies (Poecilia reticulata) goldfish (Carassius auratus) and fathead minnows (Pimephales promelas) were exposed to 125 parts per million of the carcinogen diethylnitrosamine